APPENDIX I

CALIBRATION DATA

APPENDIX II

TEST DATA AND CALCULATIONS

APPENDIX III

NATURAL GAS COMPOSITION

ARB-TDA- REPORT NO. 60-80B

Ministry of the Environment

The Honourable
Harry C. Parrott, D.D.S.,
Minister

Graham W. S. Scott, Q.C.,
Deputy Minister

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These data are on file with:

Technology Development and Appraisal Section
Air Resources Branch
Ministry of the Environment
Province of Ontario
880 Bay Street, 4th Floor
Toronto, Ontario M5S 1Z8

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Orifice Calibration					P_{bar} = 29.25 in-Hg October 23, 1979	
T_m	$(V_m)_f$ ft^3	$(V_m)_i$ ft^3	Δt (minutes)	Q_m cfm	$\sqrt{\frac{\Delta H T_m}{M_d P_o}}$	ΔH in-H_2O
75 75	1785.00	1783.00	6'-16.9" 6.282	0.318	0.252	0.10
75 78	1788.00	1786.00	3'-40.8" 3.680	0.543	0.436	0.30
79 80	1795.00	1792.00	4'-21.8" 4.363	0.688	0.564	0.50
81 84	1799.00	1796.00	3'-44.2" 3.737	0.803	0.671	0.70
85 86	1803.00	1800.00	3'-11.8" 3.197	0.938	0.782	0.95

TABLE I.1: Calibration of Sampling Train Orifice Meter

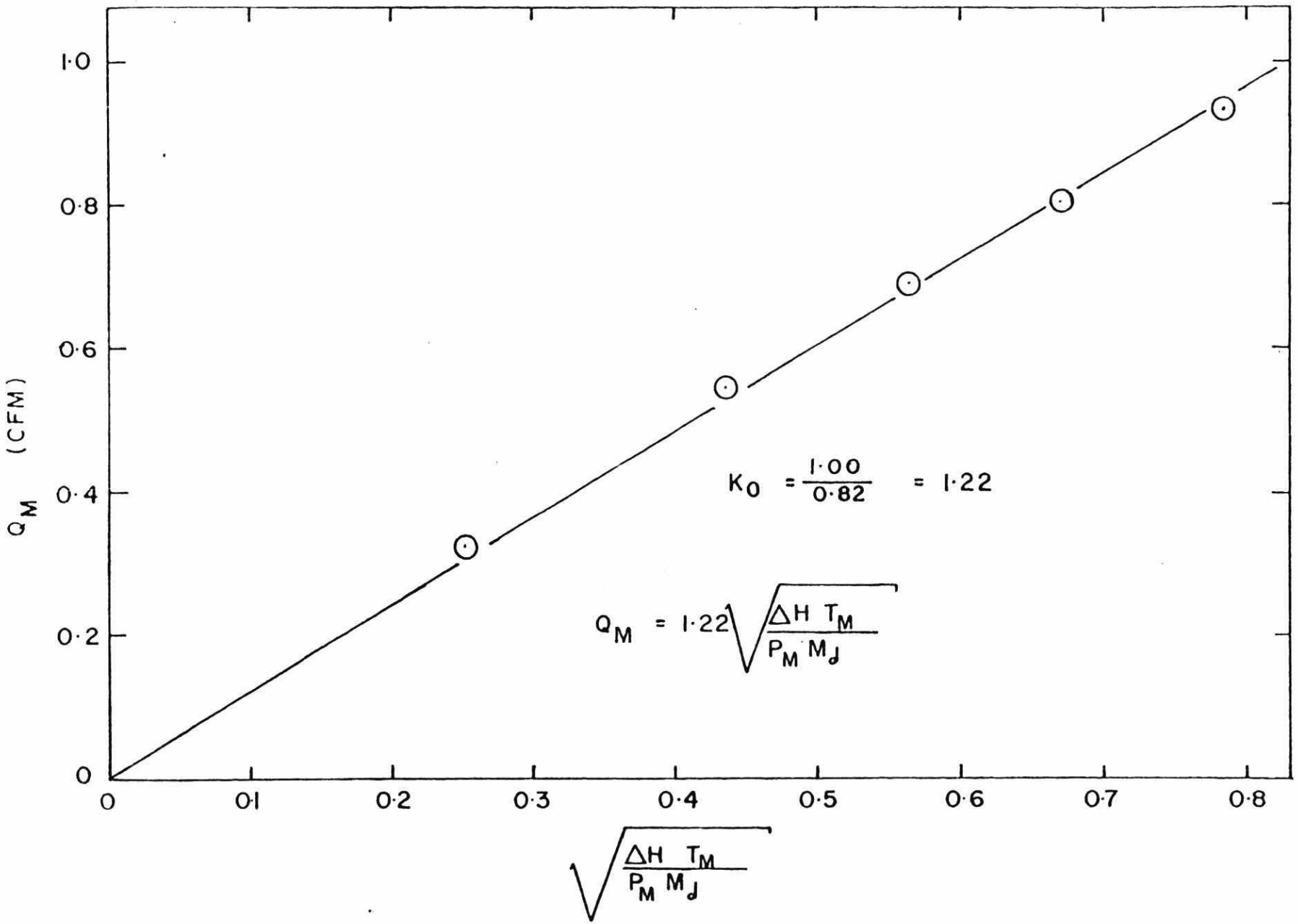


FIGURE I.1: Evaluation of Orifice Meter Constant

Teflon lined probe - October 23, 1979

C_vWt = 0.752

1/4" Nozzle	RPM	$\Delta P_{Wt.}$	ΔP	$\sqrt{\frac{\Delta P}{\Delta P_{Wt.}}}$	C_v	$\bar{C}_v$
	300	0.0875	0.1085	0.898	0.675	
	400	0.1655	0.2055	0.897	0.675	
	550	0.3380	0.4260	0.891	0.670	0.671±0.003
	700	0.5870	0.7400	0.891	0.670	
	850	0.8800	1.1140	0.889	0.668	
	1000	1.2380	1.5620	0.890	0.669	
	1100	1.5320	1.9240	0.892	0.671	
3/8" Nozzle	300	0.0930	0.1195	0.882	0.663	
	400	0.1680	0.2165	0.881	0.662	
	550	0.3500	0.4540	0.878	0.660	0.659±0.003
	700	0.5780	0.7590	0.873	0.656	
	850	0.9000	1.1740	0.876	0.658	
	1000	1.2320	1.6040	0.876	0.659	
	1100	1.4980	1.9640	0.873	0.657	
1/2" Nozzle	300	0.0890	0.11850	0.867	0.652	
	400	0.1705	0.22050	0.879	0.661	
	550	0.3440	0.45000	0.874	0.661	0.655±0.003
	700	0.5780	0.76000	0.872	0.656	
	850	0.8680	1.13800	0.873	0.657	
	1000	1.2020	1.59800	0.867	0.652	
	1100	1.4220	1.89400	0.866	0.652	

TABLE I.2: Calibration of S-Type Pitot Tube-Sampling Probe Combination

APPENDIX II

TEST DATA
AND
CALCULATIONS

PLANT MODEL 2165-D ACE GRAIN DRYER

BAROMETRIC PRESSURE (IN. Hg.) 29.47

STACK PRESSURE (IN. H_2O) _____

LOCATION NEWBURY, ONTARIO

MOISTURE CONTENT VOL. % _____

TEST 1

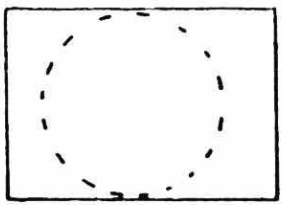
NOZZLE DIA. IN. 0.25"

DATE OCT. 26 /79

PROBE LENGTH 4' EFFECTIVE

AMBIENT TEMPERATURE °F. 39

OPERATORS D.S., C.S.T.P., A.W.G.



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	88				1803.40	255°	240	100	165°	40	1.0
A-T-1	2.5'	88	0.05"	10.33	0.04	1803.93	260	225°	85°	185°	40	1.0
2	5.0	88	0.01	4.62	0.008	1804.16	255°	235°	90	200	40	1.0
3	7.5'	88	0.01	4.62	0.008	1804.40	250	235°	90	205°	40	1.0
4	10.0	88	0.01	4.62	0.008	1804.62	245°	245°	87	210	40	1.0
5'	12.5'	88	0.01	4.62	0.008	1804.85'	240	250	90	210	40	1.0
6	15.0	88	0.01	4.62	0.008	1805.07	245°	255°	90	210	40	1.0
	0	88				1806.44	240	250	85°	210	40	2.0
A-M-1	2.5'	88	0.26	23.56	0.21	1807.66	245°	250	85°	210	40	2.0
2	5.0	88	0.265"	23.79	0.22	1808.87	245°	250	70	210	45°	2.5'
3	7.5'	88	0.27	24.01	0.22	1810.12	250	250	70	215°	45°	2.5'
4	10.0	88	0.14	17.29	0.11	1811.02	250	260	70	225°	45°	2.0
5'	12.5'	88	0.25"	23.11	0.2	1812.10	255°	260	75°	230	45°	2.2
6	15.0	88	0.195"	20.41	0.16	1813.08	260	270	80	245°	45°	2.1
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

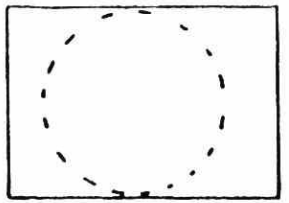
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 1 NOZZLE DIA. IN. _____

DATE OCT. 26 /79 PROBE LENGTH _____

AMBIENT TEMPERATURE °F _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	88				1813.27	260					
A-01	2.5'	88	0.47	31.68	0.38	1814.87	260	260	90	230	48	4.5"
2	5'.0	88	0.47	31.68	0.38	1816.49	260	260	70	240	48	4.5"
3	7.5'	88	0.49	32.35'	0.40	1818.13	25'5"	25'5'	80	240	5'0	4.5'
4	10.0	88	0.49	32.35'	0.40	1819.80	25'5"	25'0	80	235'	5'0	4.5"
5'	12.5'	88	0.49	32.35	0.40	1821.44	25'0	25'0	82	232	5'0	4.5"
6	15'.0	88	0.43	30.30	0.35'	1822.97	25'5'	25'0	85'	230	5'0	4.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

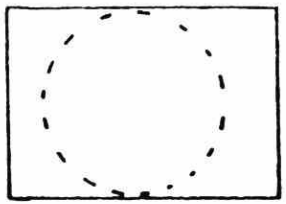
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 1 NOZZLE DIA. IN. _____

DATE OCT. 26/79 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	85				1823.47	250	235	65	145	50	1.0
B-T-1	2.5	85	0.01	4.61	0.008	1823.69	245	235	65	145	50	1.0
2	5.0	85	0.012	5.05	0.008	1823.92	240	240	62	180	50	1.0
3	7.5	85	0.01	4.61	0.008	1824.15	235	240	62	190	50	1.0
4	10.0	85	0.01	4.61	0.008	1824.37	235	240	65	200	50	1.0
5	12.5	85	0.01	4.61	0.008	1824.60	240	242	65	205	50	1.0
6	15.0	85	0.015	5.64	0.008	1824.85	245	245	62	202	50	1.0
	0	85				1825.66	245	250	60	185	50	4.0
B-A-1	2.5	85	0.30	25.24	0.24	1826.98	245	250	60	185	50	4.0
2	5.0	85	0.19	20.09	0.15	1828.02	250	250	57	210	52	3.0
3	7.5	85	0.23	22.10	0.19	1829.18	265	250	55	210	50	3.2
4	10.0	85	0.24	22.58	0.20	1830.36	250	250	57	212	51	3.2
5	12.5	85	0.23	22.10	0.19	1831.48	255	252	60	215	52	3.1
6	15.0	85	0.24	22.58	0.20	1832.63	250	252	61	220	52	3.1
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

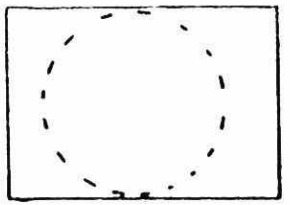
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 1 NOZZLE DIA. IN. _____

DATE OCT. 26/79 PROBE LENGTH _____

AMBIENT TEMPERATURE °F _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	85				1832.89	260	250	62	202	55	6.0
BE-1	2.5	85	0.60	35.70	0.49	1834.70	265	250	62	202	55	6.0
2	5.0	85	0.60	35.70	0.50	1836.52	260	250	62	210	55	6.0
3	7.5	85	0.61	36.00	0.51	1838.35	255	260	60	220	55	7.0
4	10.0	85	0.55	34.18	0.46	1840.10	250	258	62	225	55	6.5
5	12.5	85	0.50	32.59	0.42	1841.78	250	255	65	230	55	5.5
6	15.0	85	0.45	30.92	0.37	1843.38	245	255	70	230	55	5.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

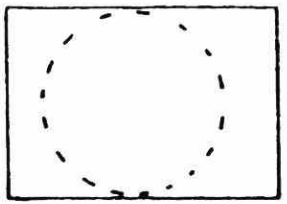
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 1 NOZZLE DIA. IN. _____

DATE OCT. 26 /79 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	85				1843.41	250	210	98	160	50	1.0
CT-1	2.5	85	0.015	5.64	0.008	1843.66	255	210	98	160	50	1.0
2	5.0	85	0.01	4.61	0.008	1843.89	255	215	85	192	48	1.0
3	7.5	85	0.01	4.61	0.008	1844.13	250	220	85	205	48	1.0
4	10.0	85	0.01	4.61	0.008	1844.36	250	222	80	205	49	1.0
5	12.5	85	0.015	5.64	0.008	1844.61	245	225	72	205	49	1.0
6	15.0	85	0.01	4.61	0.008	1844.85	245	230	75	205	49	1.0
	0	85				1846.29	245	235	75	195	50	3.0
CH-1	2.5	85	0.28	24.39	0.23	1847.57	240	235	75	195	50	3.0
2	5.0	85	0.28	24.39	0.23	1848.84	245	240	68	210	50	3.0
3	7.5	85	0.29	24.82	0.24	1850.11	250	248	65	212	51	3.0
4	10.0	85	0.23	22.10	0.19	1851.27	255	250	67	215	51	3.0
5	12.5	85	0.24	22.58	0.19	1852.44	255	255	70	220	52	3.0
6	15.0	85	0.23	22.10	0.19	1853.60	260	260	70	220	52	3.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

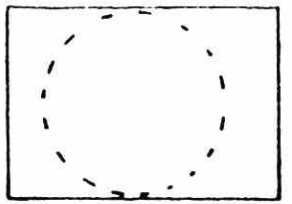
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 1 NOZZLE DIA. IN. _____

DATE OCT. 26/79 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	85				1853.66	260	255	92	210	55	4.5
C-1	2.5	85	0.55	34.18	0.45	1855.41	255	255	92	210	55	4.5
2	5.0	85	0.54	33.87	0.44	1857.10	250	265	78	235	52	4.5
3	7.5	85	0.50	32.53	0.40	1858.78	245	255	80	235	53	4.3
4	10.0	85	0.48	31.93	0.39	1860.39	245	260	84	235	51	4.2
5	12.5	85	0.50	32.53	0.40	1862.01	245	258	83	227	53	4.3
6	15.0	85	0.50	32.53	0.40	1863.66	240	260	85	232	55	4.3
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

Absolute stack gas pressure in in. Hg. is

$$Ps = Pbar + \frac{P_{static}\ in.\ H_2O}{13.6\ in.\ H_2O/in.\ Hg.}$$

$$Ps = \frac{29.47}{} + \frac{0.04}{13.6}$$

Ps = 29.47 in. Hg.

The molecular weight of the stack gas on a dry basis in lb/lb. mole. is

Md = 0.44 (% CO_2) avg. + 0.32 (% O_2) avg. + 0.28 [(% N_2) avg. + (% CO) avg.

Md = 0.44 x 0.4 + 0.32 x 20.8 + 0.28 (78.0 + ———)
+ 0.4 x 0.9 Argon

Md = 0.176 + 6.656 + 21.84 + 0.36

Md = 28.932 lb/lb. mole.

The volume of water vapour collected at reference conditions in ft^3 is

Vwc = 0.0474 ft^3/ml x volume of moisture collected ml.

Vwc = 0.0474 x 42.66

Vwc = 2.022 ft^3

The average ΔP orifice in in. H_2O is

$$\Delta P \text{ orifice avg.} = \frac{\Sigma \Delta P \text{ orifice}}{\# \text{ points}}$$

$$\Delta P \text{ orifice avg.} = \frac{11.276}{54}$$

ΔP orifice avg. = 0.209 in. H_2O

The pressure at the gas meter in in. Hg. is

$$Pm = Pbar + \frac{\Delta P \text{ orifice avg. in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg.}}$$

$$Pm = 29.47 + \frac{0.209}{13.6}$$

Pm = 29.47 + 0.015

Pm = 29.485 in. Hg.

The temperature of the total gas meter in $^{\circ}R$. is

$$Tm = \frac{\Sigma \text{ meter temp. } ^{\circ}F.}{\text{\# points}} + 460$$

$$Tm = \frac{70}{} + 460$$

$$Tm = \underline{530\ ^{\circ}R} \quad \text{Temp. Compensated}$$

The total volume of gas metered in ft^3 is

$$Vm = Vf - Vi$$

$$Vm = \underline{\quad} - \underline{\quad}$$

$$Vm = \underline{55.60}\ ft^3$$

The dry gas volume at reference conditions in ft^3 is

$$Vmc = 17.71 \frac{^{\circ}R}{\text{in. Hg.}} \quad \frac{Vm\ ft^3 \times Pm \text{ in. Hg.}}{Tm\ ^{\circ}R}$$

$$Vmc = 17.71 \times \frac{55.6 \times 29.48}{530}$$

$$Vmc = \underline{54.78}\ ft^3$$

The stack gas moisture content, i.e. the proportion by volume of water vapour in the gas stream is

$$Bwo = \frac{Vwc\ ft^3}{Vwc\ ft^3 + Vmc\ ft^3} \qquad \text{(using dry-rite)}$$

$$Bwo = \frac{2.022}{2.022 + 54.78}$$

$$Bwo = \frac{2.022}{56.802}$$

$$Bwo = 0.0356$$

The molecular weight of the stack gas on a wet basis in lb/lb mole. is

Ms = Md lb/lb mole (1-Bwo) + 18 lb/lb mole x Bwo

Ms = 28.932 x (1 - 0.0356) + 18 x 0.0356

Ms = 28.932 x 0.9644 + 0.6408

Ms = 27.902 + 0.6408

Ms = 28.543 lb/lb mole.

The average velocity of the stack in ft/sec is

$$Us = \frac{\Sigma V}{\#\ points}$$

$$Us = \frac{1093.07}{54}$$

$$Us = 20.24 \text{ ft/sec}$$

The average temperature of the stack in $^{\circ}R.$ is

$$Ts\ avg. = \frac{\Sigma\ Ts}{\#\ points} + 460$$

$$Ts\ avg. = \frac{5418}{63} + 460$$

$$Ts\ avg. = 86 + 460$$

$$Ts\ avg. = 546\ ^{\circ}R.$$

The cross-sectional area of the stack in ft^2 is

$$As = \frac{\pi D^2 ft^2}{4}$$

$$As = \frac{\pi}{4} \times (\_\_\_\_\_)^2$$

$$As = 0.7854 \times \_\_\_\_\_$$

$$As = \underline{\quad 9 \quad} ft^2 \text{ / FILTER DRUM}$$

The volumetric stack gas flowrate on a dry basis at reference conditions in ft^3/hr is

$$Qs = 3600 \text{ sec/hr} \times Us \text{ ft/sec} \times As \text{ ft}^2 \times (1-Bwo) \times \frac{T \text{ ref}}{Ts \text{ avg.}} \times \frac{Ps}{P \text{ ref}}$$

$$Qs = 3600 \times \underline{20.24} \text{ ft/sec} \times \underline{\quad 9 \quad} ft^2 \times (1 - \underline{0.0356}) \times \frac{530}{546\ ^\circ R} \times \frac{29.47 \text{ in. Hg.}}{29.92 \text{ in. Hg.}}$$

$$Qs = 3600 \times \underline{20.24} \times \underline{\quad 9 \quad} \times \underline{0.9644} \times \underline{0.9707} \times \underline{0.9850}$$

$$Qs = \underline{6.047 \times 10^5} ft^3/hr \text{ / FILTER DRUM}$$

The total amount of particulate matter collected in mg. is

$Mp = \underline{11.7}$ mg.

The concentration of particulate matter in stack gas on a dry basis at reference conditions in lb/ft^3 is

$$Cp = 2.205 \times 10^{-6} \text{ lb/mg} \times \frac{Mp}{Vmc}$$

$$Cp = 2.205 \times 10^{-6} \times \frac{11.7 \text{ mg}}{5 \cdot 4.78 \text{ ft}^3}$$

$$Cp = \underline{4.709 \times 10^{-7}} \text{ lb/ft}^3$$

The emission rate of particulate matter from the stack on a dry basis at reference conditions in lb/hr is

$ERp = Cp \text{ lb/ft}^3 \times Qs \text{ ft}^3/\text{hr}$

$ERp = \underline{4.709 \times 10^{-7}} \times \underline{6.047 \times 10^{5}}$

$ERp = \underline{0.285} \text{ lb/hr}$ / FILTER DRUM

$= 0.855$ lb/hr Total

PLANT GRAIN DRYER

DATE OCTOBER 26 1979

LOCATION NEWBURY, ONTARIO

OPERATORS

TEST 1

ANALYST

MOISTURE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF MOISTURE (gm.)
IMPINGER # 1	641.5	621.98	19.52
IMPINGER # 2	613.9	604.85	9.05
IMPINGER # 3	441.2	439.81	1.39
IMPINGER # 4	683.5	670.86	12.64
	TOTAL		42.66
	MOISTURE VOLUME		42.66 ml.

PARTICULATE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF PARTICULATE (gm.)
FILTER	0.7527	0.7526	0.0001
BEAKER WITH (PROBE - NOZZLE - CYCLONE) WASHINGS	49.3568	49.3503	0.0051
CYCLONE FLASK	48.6537	48.6472	0.0065
BEAKER WITH (IMPINGER FILTER-HOLDER) CONTENTS AND WASHINGS	47.7275	47.7275	0.0000
	TOTAL (gm.)		0.0117
	PARTICULATES IN (mg.)		11.7

MODEL 2165-3

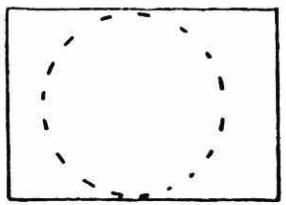
PLANT ACE CANADA ONTARIO BAROMETRIC PRESSURE (IN. Hg.) 29.47 STACK PRESSURE (IN. H_2O) ____

LOCATION NEWMARKET, ONTARIO MOISTURE CONTENT VOL. % ____

TEST 2 NOZZLE DIA. IN. 0.250

DATE OCTOBER 26, 1979 PROBE LENGTH 4' EFFECTIVE

AMBIENT TEMPERATURE °F. 42 OPERATORS AWG, DS, CSP



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME (FT.^{3})	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	87				1870.00	235	225	42	75	40	—
DT-1	2.5	87	0.02	6.53	0.016	1870.33	240	225	43	122	42	0.5
2	5.0	85	0.01	4.61	0.008	1870.56	242	222	45	140	45	0.5
3	7.5	85	0.013	5.25	0.008	1870.82	248	240	45	145	45	0.5
4	10.0	87	0.01	4.62	0.008	1871.06	245	250	45	150	45	0.5
5	12.5	87	0.01	4.62	0.008	1871.28	241	252	45	150	43	0.5
6	15.0	87	0.01	4.62	0.008	1871.51	235	260	42	160	41	0.5
	0	86				1871.51	240	262	42	140	41	—
DH-1	2.5	86	0.30	25.26	0.23	1872.73	245	215	40	150	50	0.5
2	5.0	86	0.265	23.74	0.21	1873.90	250	210	40	154	50	0.5
3	7.5	86	0.27	23.96	0.22	1875.07	253	212	41	175	51	0.5
4	10.0	87	0.22	21.65	0.17	1876.16	255	210	41	183	51	0.5
5	12.5	87	0.29	24.86	0.23	1877.43	252	210	41	170	52	0.5
6	15.0	87	0.20	20.64	0.16	1878.43	250	209	41	171	53	0.5
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

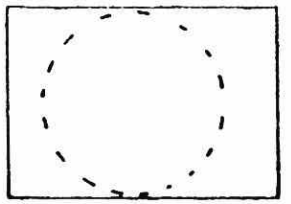
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) 29.47 STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 2 NOZZLE DIA. IN. 0.250

DATE OCTOBER 26, 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./ SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	87				1878.43	270	240	44	150	55	—
DB-1	2.5	87	0.57	34.85	0.46	1880.15	272	245	44	160	55	4.8
2	5.0	87	0.60	35.75	0.49	1881.91	275	250	45	195	58	5.0
3	7.5	87	0.58	35.15	0.48	1883.65	272	255	45	200	57	4.8
4	10.0	87	0.62	36.34	0.51	1885.39	270	250	45	117	57	5.2
5	12.5	87	0.59	35.45	0.48	1887.22	270	250	46	205	58	4.1
6	15.0	87	0.55	34.23	0.45	1888.94	270	250	45	202	60	4.5
	0	87				1890.01	240	285	40	120	55	—
FT-1	2.5	87	0.02	6.53	0.016	1890.34	245	290	40	145	58	1.0
2	5.0	87	0.02	6.53	0.016	1890.66	290	280	55	170	58	1.1
3	7.5	87	0.015	5.65	0.01	1890.95	295	275	52	171	61	1.0
4	10.0	87	0.01	4.62	0.008	1891.18	260	270	52	210	57	1.0
5	12.5	87	0.01	4.62	0.008	1891.40	290	270	55	210	61	1.0
6	15.0	87	0.01	4.62	0.008	1891.63	295	270	58	215	57	1.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

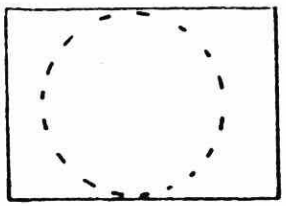
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) 29.44 STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 2 NOZZLE DIA. IN. 0.250

DATE OCTOBER 26, 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME (FT.^{3})	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	90				1891.63	250	285	65	170	58	
A-1	2.5	90	0.18	19.69	0.15	1892.60	255	285	65	205	58	7.6
2	5.0	90	0.30	25.35	0.25	1893.88	260	280	50	205	59	5.2
3	7.5	90	0.20	20.70	0.17	1894.87	265	280	45	195	59	5.0
4	10.0	90	0.27	24.05	0.22	1896.03	262	270	43	190	59	3.1
5	12.5	90	0.20	20.70	0.17	1897.04	260	262	40	190	58	3.0
6	15.0	90	0.28	24.99	0.23	1898.29	255	250	40	180	59	3.1
	0	90				1898.24	255	260	45	190	57	
B-1	2.5	90	0.58	35.25	0.48	1899.94	255	260	40	190	58	5.0
2	5.0	90	0.56	34.63	0.47	1901.66	260	260	40	190	57	5.2
3	7.5	90	0.53	33.69	0.44	1903.26	265	[illegible]	[illegible]	200	58	[illegible]
4	10.0	90	0.62	36.94	0.51	1904.96	[illegible]	260	[illegible]	[illegible]	59	[illegible]
5	12.5	90	0.61	36.15	0.50	1906.79	[illegible]	[illegible]	[illegible]	205	60	[illegible]
6	15.0	90	0.49	32.40	0.41	1908.42	[illegible]	[illegible]	[illegible]	205	61	[illegible]
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

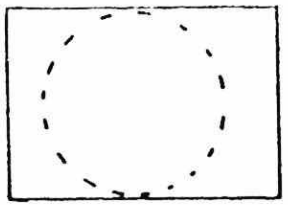
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) 27.17 STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 2 NOZZLE DIA. IN. 0.230

DATE October 26, 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	90				1910.03	220	240	42	100	85	—
FT-1	2.5	90	0.01	4.63	0.008	1910.26	225	240	42	105	85	0.5
2	5.0	90	0.01	4.63	0.008	1910.48	225	240	40	135	85	0.5
3	7.5	90	0.01	4.63	0.008	1910.69	230	235	40	150	90	0.5
4	10.0	90	0.01	4.63	0.008	1910.91	232	260	40	160	90	0.5
5	12.5	90	0.01	4.63	0.008	1911.14	235	270	50	170	90	0.5
6	15.0	93	0.02	6.56	0.016	1911.47	240	270	50	175	92	0.5
	0	93				1911.97	223	270	50	170	95	—
FT-1	2.5	93	0.30	25.42	0.25	1912.75	235	280	50	170	95	3.0
2	5.0	93	0.32	26.25	0.26	1914.07	230	270	50	170	95	3.0
3	7.5	93	0.31	25.84	0.255	1915.30	230	300	50	170	95	3.0
4	10.0	93	0.28	24.56	0.23	1916.50	240	300	50	170	95	3.0
5	12.5	93	0.28	24.56	0.23	1917.71	250	300	50	170	95	3.0
6	15.0	93	0.27	24.14	0.24	1918.96	255	300	50	170	95	3.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

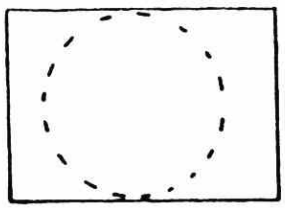
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) 29.42 STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 2 NOZZLE DIA. IN. 0.250

DATE October 26, 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	93				1918.96	260	250	45	170	55	—
1B-1	2.5	93	0.58	35.34	0.47	1920.73	260	250	42	175	55	5.0
2	5.0	93	0.58	35.34	0.98	1922.47	265	255	41	180	55	5.1
3	7.5	93	0.55	34.42	0.46	1924.14	270	260	40	185	55	4.8
4	10.0	93	0.62	36.59	0.51	1925.94	270	260	40	185	56	5.5
5	12.5	93	0.60	35.95	0.49	1927.69	270	260	40	190	56	5.2
6	15.0	93	0.52	33.46	0.43	1929.38	280	260	40	190	56	4.7
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

The volume of water vapour collected at reference conditions in ft^3 is

Vwc = 0.0474 ft^3/ml x volume of moisture collected ml.

Vwc = 0.0474 x 43.6

Vwc = 2.304 ft^3

The average ΔP orifice in in. H_2O is

$$\Delta P \text{ orifice avg.} = \frac{\Sigma \Delta P \text{ orifice}}{\# \text{ points}}$$

$$\Delta P \text{ orifice avg.} = \frac{12.573}{54}$$

ΔP orifice avg. = 0.233 in. H_2O

The pressure at the gas meter in in. Hg. is

$$Pm = Pbar + \frac{\Delta P \text{ orifice avg. in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg.}}$$

$$Pm = 29.47 + \frac{0.233}{13.6}$$

Pm = 29.47 + 0.017

Pm = 29.49 in. Hg.

Absolute stack gas pressure in in. Hg. is

$$Ps = Pbar + \frac{P_{static}\ in.\ H_2O}{13.6\ in.\ H_2O/in.\ Hg.}$$

$$Ps = \underline{29.47} + \frac{\underline{0.04}}{13.6}$$

Ps = 29.47 in. Hg.

The molecular weight of the stack gas on a dry basis in lb/lb. mole. is

Md = 0.44 (% CO_2) avg. + 0.32 (% O_2) avg. + 0.28 [(% N_2) avg. + (% CO) avg.

Md = 0.44 x 0.4 + 0.32 x 20.7 + 0.28 (78.0 + 0) +(0.40)(0.9)

Md = 0.176 + 6.624 + 21.84 + 0.36

Md = 29.00 lb/lb. mole.

The temperature of the total gas meter in ^{o}R. is

$$Tm = \frac{\Sigma \text{ meter temp. } ^{o}F.}{\text{\# points}} + 460$$

Tm = _____ + 460

Tm = 530 ^{o}R (TEMPERATURE COMPENSATED)

The total volume of gas metered in ft^3 is

Vm = Vf - Vi

Vm = _____ - _____

Vm = 56.70 ft^3

The dry gas volume at reference conditions in ft^3 is

$$Vmc = 17.71 \frac{^{o}R}{\text{in. Hg.}} \quad \frac{Vm\ ft^3 \times Pm \text{ in. Hg.}}{Tm\ ^{o}R}$$

$$Vmc = 17.71 \times \frac{56.70 \times 29.49}{530}$$

Vmc = 55.87 ft^3

The stack gas moisture content, i.e. the proportion by volume of water vapour in the gas stream is

$$Bwo = \frac{Vwc\ ft^3}{Vwc\ ft^3 + Vmc\ ft^3} \qquad \text{(using dry-rite)}$$

$$Bwo = \frac{2.304}{2.304 + 55.87}$$

$$Bwo = \frac{\quad}{\quad}$$

$$Bwo = 0.0396$$

The molecular weight of the stack gas on a wet basis in lb/lb mole. is

Ms = Md lb/lb mole (1-Bwo) + 18 lb/lb mole x Bwo

Ms = 29.00 x (1 - 0.0396) + 18 x 0.0396

Ms = 29.00 x 0.9604 + 0.713

Ms = 27.85 + 0.713

Ms = 28.56 lb/lb mole.

The average velocity of the stack in ft/sec is

$$Us = \frac{\Sigma V}{\#\ points}$$

$$Us = \frac{1150.57}{54}$$

$$Us = 21.31 \text{ ft/sec}$$

The average temperature of the stack in $^{\circ}R.$ is

$$Ts\ avg. = \frac{\Sigma Ts}{\#\ points} + 460$$

$$Ts\ avg. = \frac{4819}{54} + 460$$

$$Ts\ avg. = 89.2 + 460$$

$$Ts\ avg. = 549.2^{\circ}R.$$

The cross-sectional area of the stack in ft^2 is

$$As = \frac{\pi D^2 ft^2}{4}$$

$$As = \frac{\pi}{4} \times (\_\_\_\_\_)^2$$

$$As = 0.7854 \times \_\_\_\_\_$$

As = 9.0 ft^2 / FILTER DRUM

The volumetric stack gas flowrate on a dry basis at reference conditions in ft^3/hr is

$$Qs = 3600 \text{ sec/hr} \times Us \text{ ft/sec} \times As \text{ ft}^2 \times (1-Bwo) \times \frac{T \text{ ref}}{Ts \text{ avg.}} \times \frac{Ps}{P \text{ ref}}$$

$$Qs = 3600 \times 21.31 \text{ ft/sec} \times 9.0 \text{ ft}^2 \times (1 - 0.0396) \times \frac{530}{549.2 \text{ °R}} \times \frac{29.47 \text{ in. Hg.}}{29.92 \text{ in. Hg.}}$$

$$Qs = 3600 \times 21.31 \times 9.0 \times 0.9604 \times 0.9650 \times 0.9850$$

Qs = 6.30×10^5 ft^3/hr / FILTER DRUM

1.89×10^6 ft^3/hr TOTAL

The total amount of particulate matter collected in mg. is

$Mp = \underline{12.6}$ mg.

The concentration of particulate matter in stack gas on a dry basis at reference conditions in lb/ft^3 is

$$Cp = 2.205 \times 10^{-6} \text{ lb/mg} \times \frac{Mp}{Vmc}$$

$$Cp = 2.205 \times 10^{-6} \times \frac{12.6 \text{ mg}}{55.87 \text{ ft}^3}$$

$$Cp = \underline{4.97 \times 10^{-7}} \text{ lb/ft}^3$$

The emission rate of particulate matter from the stack on a dry basis at reference conditions in lb/hr is

$$ERp = Cp \text{ lb/ft}^3 \times Qs \text{ ft}^3/\text{hr}$$

$$ERp = \underline{4.97 \times 10^{-7}} \times \underline{6.30 \times 10^{5}}$$

$$ERp = \underline{0.313} \text{ lb/hr / FILTER DRUM}$$

$$= \underline{0.939} \text{ lbs/hr TOTAL}$$

PLANT GRAIN DRYER DATE OCTOBER 26, 1977

LOCATION NEWBERRY OPERATORS

TEST 2 ANALYST

MOISTURE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF MOISTURE (gm.)
IMPINGER # 1	680.3	651.3	29.0
IMPINGER # 2	624.5	616.6	7.9
IMPINGER # 3	446.8	442.6	4.2
IMPINGER # 4	693.5	686.0	7.5
	TOTAL		48.6
	MOISTURE VOLUME		48.6 ml.

PARTICULATE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF PARTICULATE (gm.)
FILTER	0.7631	0.7630	0.0001
BEAKER WITH (PROBE - NOZZLE - CYCLONE) WASHINGS	50.9446	50.9402	0.0044
CYCLONE FLASK	47.4063	47.3982	0.0081
BEAKER WITH (IMPINGER FILTER-HOLDER) CONTENTS AND WASHINGS	47.8870	47.8872	0.0000
	TOTAL (gm.)		0.0126
	PARTICULATES IN (mg.)		12.6

PLANT MODEL 2165-D ACE GRAIN DRYER

BAROMETRIC PRESSURE (IN. Hg.) 29.53

STACK PRESSURE (IN. H_2O)

LOCATION NEWBURY, ONTARIO

MOISTURE CONTENT VOL. %

TEST TEST 3

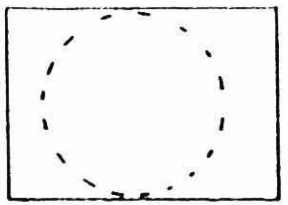
NOZZLE DIA. IN. 0.25"

DATE OCT. 27/79

PROBE LENGTH 4' EFFECTIVE

AMBIENT TEMPERATURE °F. 44

OPERATORS D.S., C.S.T.P., A.W.G.



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	86				1960.02	250	220	35"	97	45"	0.5"
AT-1	2.5"	86	0.04	3.20	0.03	1960.49	255"	220	35"	97	45"	0.5"
2	5:0	86	0.03	7.97	0.024	1960.91	255"	232	40	150	35"	0.5"
3	7.5"	86	0.01	4.60	0.008	1961.15"	260	245"	48	195"	35"	0.5"
4	10.0	86	0.01	4.60	0.008	1961.38	255"	252	56	212	35"	0.5"
5"	12.5"	86	0.01	4.60	0.008	1961.61	250	258	62	215"	37	0.5"
6	15:0	86	0.01	4.60	0.008	1961.85"	250	262	65"	215"	38	0.5"
	0	96				1962.94	240	270	70	207	40	2.2
AT-1	2.5"	86	0.25	23.01	0.20	1964.15"	245"	270	70	207	40	2.2
2	5:0	86	0.25"	23.01	0.20	1965.35"	245"	271	59	215"	40	2.2
3	7.5"	96	0.22	21.58	0.18	1966.48	245"	272	58	220	40	2.0
4	10.0	96	0.23	22.07	0.19	1967.62	250	270	59	220	41	2.2
5"	12.5"	96	0.24	22.54	0.19	1968.77	260	269	59	218	42	2.3
6	15.0	96	0.17	18.97	0.14	1969.76	265"	269	60	220	45"	2.2
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

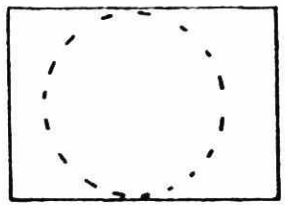
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 3 NOZZLE DIA. IN. _____

DATE Oct. 27/79 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	86				1969.87	260					
AB-1	2.5	86	0.43	30.17	0.35	1971.37	260	270	70	202	45	3.5
2	5.0	86	0.42	29.82	0.34	1972.87	260	268	59	222	45	3.5
3	7.5	86	0.33	26.43	0.27	1974.26	265	265	60	230	47	3.5
4	10.0	86	0.44	30.52	0.36	1975.77	265	252	59	228	47	3.8
5	12.5	86	0.43	30.17	0.35	1977.31	260	265	59	230	47	3.9
6	15.0	86	0.39	28.73	0.32	1978.77	260	265	59	230	48	3.5
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

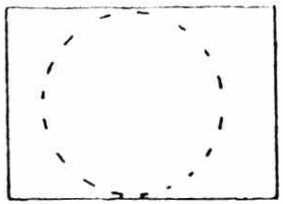
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 3 _____ NOZZLE DIA. IN. _____

DATE OCT. 27/79 _____ PROBE LENGTH _____

AMBIENT TEMPERATURE °F _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	86				1978.85	270	295	95	185	47	0.5
A-1	2.5	86	0.01	4.60	0.008	1979.07	270	295	95	185	47	0.5
2	5.0	86	0.01	4.60	0.008	1979.30	270	295	90	220	48	0.5
3	7.5	86	0.01	4.60	0.008	1979.54	265	295	85	230	49	0.5
4	10.0	86	0.01	4.60	0.008	1979.78	265	290	80	230	48	0.5
5	12.5	86	0.01	4.60	0.008	1980.01	265	287	80	227	49	0.6
6	15.0	86	0.01	4.60	0.008	1980.24	265	290	78	230	48	0.6
	0	86				1981.44	260	287	80	210	50	6.0
B-1	2.5	86	0.27	23.91	0.22	1982.65	255	287	80	210	50	6.0
2	5.0	86	0.28	24.35	0.23	1983.92	260	287	65	225	50	6.5
3	7.5	86	0.28	24.35	0.23	1985.18	260	285	62	230	50	6.5
4	10.0	86	0.26	23.46	0.21	1986.40	255	280	60	230	50	6.2
5	12.5	86	0.22	21.58	0.18	1987.50	255	275	60	230	51	5.2
6	15.0	86	0.20	20.58	0.16	1988.56	250	280	65	230	52	5.2
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

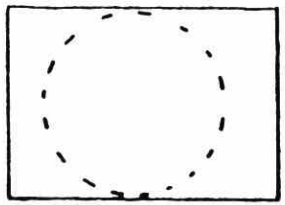
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 3 _____ NOZZLE DIA. IN. _____

DATE Oct. 27/79 _____ PROBE LENGTH _____

AMBIENT TEMPERATURE °F _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	86				1988.64	230	280	65°	220	52	11
BB-1	2.5	86	0.5°	32.53	0.41	1990.07	230	280	65°	220	52	11
2	5.0	86	0.51	32.86	0.42	1991.51	235	280	65°	225°	51	11
3	7.5	86	0.50	32.53	0.41	1992.96	240	280	65°	230	55°	11
4	10.0	86	0.50	32.53	0.42	1994.40	245	270	65°	220	55°	11.5°
5°	12.5	86	0.45°	30.87	0.37	1995.77	245°	270	65°	220	55°	11.5°
6	15.0	86	0.43	30.17	0.36	1997.14	245	270	65°	220	55°	11.5°
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

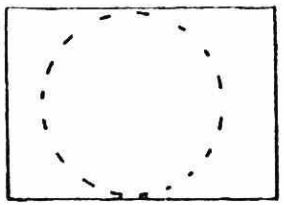
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 3 NOZZLE DIA. IN. _____

DATE OCT. 27 /79 PROBE LENGTH _____

AMBIENT TEMPERATURE °F _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	86				1997.23	245	260	95	185	55	0.5
CT-1	2.5	86	0.1	14.55	0.083	1997.95	245	260	95	185	55	0.5
2	5.0	86	0.1	14.55	0.083	1998.70	245	275	90	220	53	1.0
3	7.5	86	0.1	14.55	0.083	1999.44	240	295	85	242	53	1.0
4	10.0	86	.05	10.29	0.042	1999.96	245	305	85	255	54	0.8
5	12.5	86	.05	10.29	0.042	2000.49	250	300	84	250	53	0.8
6	15.0	86	.05	10.29	0.042	2001.03	250	300	84	250	54	0.8
	0	86				2001.50	255	295	97	200	55	3.0
CM-1	2.5	86	.23	22.07	0.19	2002.66	255	295	97	200	55	3.0
2	5.0	86	0.20	20.58	0.17	2003.74	260	295	72	235	55	2.6
3	7.5	86	0.25	23.01	0.21	2004.95	260	290	72	235	55	3.0
4	10.0	86	0.20	20.58	0.17	2006.02	260	290	69	235	55	2.6
5	12.5	86	0.27	23.91	0.22	2007.25	265	290	70	235	55	3.0
6	15.0	86	0.22	21.58	0.18	2008.38	260	285	70	235	55	2.7
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

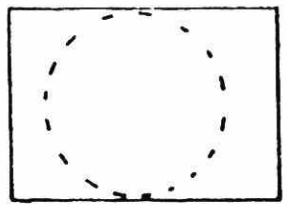
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 3 NOZZLE DIA. IN. _____

DATE Oct. 27 /79 PROBE LENGTH _____

AMBIENT TEMPERATURE °F _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	86				2008.50	255	280	69	170	55	4.7
CO-1	2.5	86	0.5	32.53	0.41	2010.19	255	280	69	170	55	4.7
2	5.0	86	0.5	32.53	0.41	2011.89	250	280	67	215	55	4.5
3	7.5	86	0.4	29.10	0.33	2013.38	245	282	63	225	55	4.3
4	10.0	86	0.26	23.46	0.22	2014.60	240	270	65	225	55	3.0
5	12.5	86	0.3	25.20	0.25	2015.92	240	270	65	225	57	3.2
6	15.0	86	0.38	28.36	0.32	2017.40	235	275	67	225	56	3.7
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

Absolute stack gas pressure in in. Hg. is

$$Ps = Pbar + \frac{P_{static}\ in.\ H_2O}{13.6\ in.\ H_2O/in.\ Hg.}$$

$$Ps = \frac{29.53}{} + \frac{0.04}{13.6}$$

Ps = 29.53 in. Hg.

The molecular weight of the stack gas on a dry basis in lb/lb.mole. is

$$Md = 0.44\ (\%\ CO_2)\ avg. + 0.32\ (\%\ O_2)\ avg. + 0.28\ [(\%\ N_2)\ avg. + (\%\ CO)\ avg.$$

$$Md = 0.44 \times \underline{0.4} + 0.32 \times \underline{20.8} + 0.28\ (\underline{77.9} + \underline{\quad} + 0.4 \times 0.9)$$

$$Md = \underline{0.176} + \underline{6.656} + \underline{21.81} + 0.36$$

Md = 29.002 lb/lb mole.

The volume of water vapour collected at reference conditions in ft^3 is

V_{wc} = 0.0474 ft^3/ml x volume of moisture collected ml.

V_{wc} = 0.0474 x 39.3

V_{wc} = 1.863 ft^3

The average ΔP orifice in in. H_2O is

$$\Delta P \text{ orifice avg.} = \frac{\Sigma \Delta P \text{ orifice}}{\# \text{ points}}$$

$$\Delta P \text{ orifice avg.} = \frac{11.004}{54}$$

ΔP orifice avg. = 0.204 in. H_2O

The pressure at the gas meter in in. Hg. is

$$P_m = P_{bar} + \frac{\Delta P \text{ orifice avg. in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg.}}$$

$$P_m = 29.53 + \frac{0.204}{13.6}$$

P_m = 29.53 + 0.015

P_m = 29.545 in. Hg.

The temperature of the total gas meter in ^{o}R. is

$$Tm = \frac{\Sigma \text{ meter temp. } ^{o}F.}{\text{\# points}} + 460$$

$$Tm = \frac{70}{} + 460$$

$$Tm = \underline{530\ ^{o}R} \quad \text{Temperature Compensated}$$

The total volume of gas metered in ft^3 is

$$Vm = Vf - Vi$$

$$Vm = \underline{\quad} - \underline{\quad}$$

$$Vm = \underline{54.14}\ ft^3$$

The dry gas volume at reference conditions in ft^3 is

$$Vmc = 17.71 \frac{^{o}R}{\text{in. Hg.}} \quad \frac{Vm\ ft^3 \times Pm \text{ in. Hg.}}{Tm\ ^{o}R}$$

$$Vmc = 17.71 \times \frac{54.14 \times 29.545}{530}$$

$$Vmc = \underline{53.450}\ ft^3$$

The stack gas moisture content, i.e. the proportion by volume of water vapour in the gas stream is

$$Bwo = \frac{Vwc\ ft^3}{Vwc\ ft^3 + Vmc\ ft^3} \qquad \text{(using dry-rite)}$$

$$Bwo = \frac{1.863}{1.863 + 53.450}$$

$$Bwo = \frac{1.863}{55.314}$$

$$Bwo = 0.0337$$

The molecular weight of the stack gas on a wet basis in lb/lb mole. is

Ms = Md lb/lb mole (1-Bwo) + 18 lb/lb mole x Bwo

Ms = 29.002 x (1 - 0.0337) + 18 x 0.0337

Ms = 29.002 x 0.9663 + 0.6066

Ms = 28.025 + 0.6066

Ms = 28.632 lb/lb mole.

The average velocity of the stack in ft/sec is

$$Us = \frac{\Sigma V}{\#\ points}$$

$$Us = \frac{105.34}{54}$$

$$Us = 19.58 \text{ ft/sec}$$

The average temperature of the stack in $^{\circ}R.$ is

$$Ts\ avg. = \frac{\Sigma Ts}{\#\ points} + 460$$

$$Ts\ avg. = \frac{5418}{63} + 460$$

$$Ts\ avg. = 86 + 460$$

$$Ts\ avg. = 546\ ^{\circ}R.$$

The cross-sectional area of the stack in ft^2 is

$$As = \frac{\pi D^2 ft^2}{4}$$

$$As = \frac{\pi}{4} \times (\_\_\_\_\_)^2$$

$$As = 0.7854 \times \_\_\_\_\_$$

$$As = \underline{\quad 9 \quad} ft^2 \text{ / FILTER DRUM}$$

The volumetric stack gas flowrate on a dry basis at reference conditions in ft^3/hr is

$$Qs = 3600 \text{ sec/hr} \times Us \text{ ft/sec} \times As \text{ ft}^2 \times (1-Bwo) \times \frac{T \text{ ref}}{Ts \text{ avg.}} \times \frac{Ps}{P \text{ ref}}$$

$$Qs = 3600 \times \underline{19.58} \text{ ft/sec} \times \underline{9} \text{ ft}^2 \times (1 - \underline{0.0337}) \times \frac{530}{\underline{5\text{-}46}^\circ R} \times \frac{\underline{29.53} \text{ in. Hg.}}{29.92 \text{ in. Hg.}}$$

$$Qs = 3600 \times \underline{19.58} \times \underline{9} \times \underline{0.9663} \times \underline{0.9707} \times \underline{0.9870}$$

$$Qs = \underline{5.873 \times 10^{5}} \text{ ft}^3/hr \text{ / FILTER DRUM}$$

The total amount of particulate matter collected in mg. is

Mp = 10.8 mg.

The concentration of particulate matter in stack gas on a dry basis at reference conditions in lb/ft^3 is

$$Cp = 2.205 \times 10^{-6} \text{ lb/mg} \times \frac{Mp}{Vmc}$$

$$Cp = 2.205 \times 10^{-6} \times \frac{10.8 \text{ mg}}{53.450 \text{ ft}^3}$$

$$Cp = 4.455 \times 10^{-7} \text{ lb/ft}^3$$

The emission rate of particulate matter from the stack on a dry basis at reference conditions in lb/hr is

$$ERp = Cp \text{ lb/ft}^3 \times Qs \text{ ft}^3/\text{hr}$$

$$ERp = 4.455 \times 10^{-7} \times 5.873 \times 10^{5}$$

ERp = 0.262 lb/hr / FILTER DRUM

= 0.786 lb/hr Total

PLANT GRAIN DRIER

DATE OCTOBER 27, 1982

LOCATION NELSONVILLE, OHIO

OPERATORS

TEST 3

ANALYST

MOISTURE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF MOISTURE (gm.)
IMPINGER # 1	570.4	548.8	21.6
IMPINGER # 2	582.3	575.9	6.4
IMPINGER # 3	446.3	445.4	0.9
IMPINGER # 4	662.2	651.8	10.4
	TOTAL		39.3
	MOISTURE VOLUME		39.3 ml.

PARTICULATE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF PARTICULATE (gm.)
FILTER	0.7393	0.7392	0.0001
BEAKER WITH (PROBE - NOZZLE - CYCLONE) WASHINGS	48.2724	48.2672	0.0052
CYCLONE FLASK	47.3040	47.2985	0.0055
BEAKER WITH (IMPINGER FILTER-HOLDER) CONTENTS AND WASHINGS	48.5269	48.5273	0.0000
	TOTAL (gm.)		0.0108
	PARTICULATES IN (mg.)		10.8

MODEL 2165-0

PLANT Basin Drive

BAROMETRIC PRESSURE (IN. Hg.) 29.53

STACK PRESSURE (IN. H_2O)

LOCATION Mississauga, Ontario

MOISTURE CONTENT VOL. %

TEST #2

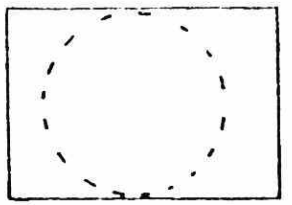
NOZZLE DIA. IN. 0.250

DATE December 27, 1979

PROBE LENGTH 4' - Effective

AMBIENT TEMPERATURE °F. 44

OPERATORS AWG, DS, CSP



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME (FT.^{3})	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	88				2019.51	235	220	43	55	45	—
DT-1	2.5	88	0.01	4.62	0.008	2019.74	240	220	43	58	45	0.5
2	5.0	88	0.01	4.62	0.008	2019.96	245	225	48	80	45	0.5
3	7.5	88	0.01	4.62	0.008	2020.19	240	230	48	97	45	0.5
4	10.0	88	0.01	4.62	0.008	2020.41	240	235	48	110	48	0.5
5	12.5	88	0.01	4.62	0.008	2020.64	245	240	48	120	48	0.5
6	15.0	88	0.01	4.62	0.008	2020.87	245	240	48	125	48	0.5
	0	88				2020.81	245	240	45	110	50	—
UT-1	2.5	88	0.26	23.60	0.21	2022.09	250	240	45	112	50	3.0
2	5.0	88	0.22	21.71	0.17	2023.07	255	250	45	142	50	2.5
3	7.5	88	0.29	24.93	0.24	2024.19	260	250	45	145	50	3.0
4	10.0	88	0.29	24.93	0.24	2025.32	260	245	45	150	52	3.0
5	12.5	88	0.30	25.35	0.25	2026.73	260	240	45	157	55	3.2
6	15.0	88	0.25	23.14	0.22	2027.81	260	245	47	160	55	3.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

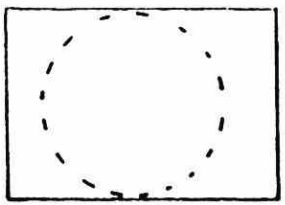
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) 29.53 STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 4 NOZZLE DIA. IN. 0.250

DATE October 27, 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	88				2027.81	245	250	47	140	55	—
00-1	2.5	88	0.54	34.02	0.44	2029.49	250	250	47	140	55	5.0
2	5.0	88	0.53	33.70	0.43	2031.14	255	255	47	160	57	5.0
3	7.5	88	0.53	33.70	0.43	2032.74	260	250	47	160	57	5.0
4	10.0	88	0.52	33.38	0.42	2034.32	260	247	46	170	55	5.0
5	12.5	88	0.525	33.54	0.42	2035.96	251	241	46	170	57	5.0
6	15.0	88	0.45	31.05	0.34	2037.46	255	242	46	170	57	4.0
	0	88	0.01			2038.03	240	220	45	65	57	—
00-1	2.5	88	0.01	4.62	0.007	2038.26	245	220	42	107	57	5.0
2	5.0	88	0.01	4.62	0.008	2038.48	250	230	45	120	57	5.0
3	7.5	88	0.01	4.62	0.008	2038.71	252	230	45	120	57	5.0
4	10.0	88	0.01	4.62	0.008	2038.94	255	230	45	120	58	5.0
5	12.5	88	0.01	4.62	0.007	2039.17	255	240	47	120	57	5.0
6	15.0	88	0.01	4.62	0.008	2039.40	255	240	45	120	57	5.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

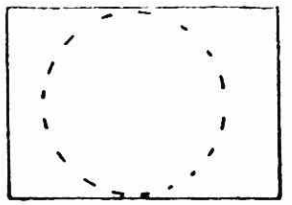
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) 27.52 STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 4 NOZZLE DIA. IN. 0.250

DATE OCTOBER 27, 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./ SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0					2039.40	240	250	45	120	60	—
F1-1	2.5	88	0.28	24.49	0.23	2040.59	245	250	45	130	60	3.2
2	5.0	88	0.32	26.18	0.26	2041.87	250	255	45	160	60	3.5
3	7.5	88	0.33	26.59	0.27	2043.18	252	252	45	160	60	3.5
4	10.0	88	0.32	26.18	0.26	2044.47	255	252	45	150	60	3.5
5	12.5	96	0.31	25.96	0.25	2045.76	250	260	47	155	63	3.4
6	15.0	96	0.33	26.78	0.27	2047.06	245	262	48	170	65	3.5
	0	96				2047.06	250	260	46	135	61	—
F2-1	2.5	96	0.57	34.95	0.46	2048.73	250	270	46	180	62	5.0
2	5.0	96	0.535	34.10	0.43	2050.37	250	275	45	180	62	5.0
3	7.5	96	0.585	35.66	0.47	2052.14	255	270	46	170	60	5.0
4	10.0	96	0.54	35.81	0.48	2053.92	255	270	47	165	60	5.0
5	12.5	96	0.56	34.89	0.45	2055.64	251	272	47	165	60	5.0
6	15.0	96	0.465	31.79	0.35	2057.21	255	265	47	170	60	5.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

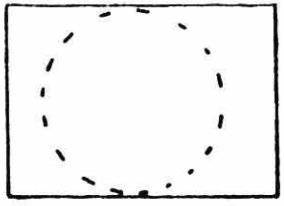
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) 29.53 STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST A NOZZLE DIA. IN. 0.250

DATE OCTOBER 27, 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	96				2058.02	235	228	45	70	60	—
FT-1	2.5	96	0.01	4.66	0.008	2058.25	237	232	45	120	60	0.5
2	5.0	96	0.01	4.66	0.008	2058.49	240	242	45	130	60	0.5
3	7.5	96	0.01	4.66	0.008	2058.72	245	250	45	130	60	0.5
4	10.0	96	0.01	4.66	0.008	2058.95	248	255	45	130	60	0.5
5	12.5	96	0.01	4.66	0.008	2059.18	250	260	45	129	60	0.5
6	15.0	97	0.01	4.66	0.008	2059.42	245	255	45	130	60	0.5
	0	97				2059.42	240	270	42	120	60	
FT-1	2.5	97	0.27	25.13	0.24	2060.66	240	270	44	130	61	3.0
2	5.0	97	0.25	23.33	0.19	2061.80	245	260	45	160	61	3.0
3	7.5	97	0.29	25.13	0.24	2063.04	250	260	45	165	61	3.0
4	10.0	97	0.25	23.33	0.19	2064.19	250	270	44	165	61	3.0
5	12.5	97	0.18	19.80	0.14	2065.17	250	270	46	165	61	
6	15.0	97	0.16	18.67	0.15	2066.09	250	270	42	165	61	
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

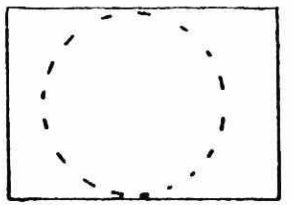
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) 29.35 STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 4 NOZZLE DIA. IN. 0.250

DATE October 27, 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	97				2066.09	245	270	42	165	61	—
1A-1	2.5	97	0.41	29.88	0.33	2067.55	240	280	42	165	61	3.5
2	5.0	97	0.44	30.96	0.35	2069.08	235	280	41	180	62	4.2
3	7.5	97	0.55	34.61	0.45	2070.79	235	275	41	175	62	5.5
4	10.0	97	0.51	33.33	0.41	2072.44	240	270	41	175	62	4.1
5	12.5	97	0.48	32.33	0.39	2074.06	245	270	41	175	63	4.2
6	15.0	97	0.48	32.33	0.39	2075.68	250	270	40	177	65	4.2
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

Absolute stack gas pressure in in. Hg. is

$$Ps = Pbar + \frac{P_{static}\ \text{in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg.}}$$

$$Ps = \frac{29.53}{} + \frac{0.04}{13.6}$$

Ps = 29.53 in. Hg.

The molecular weight of the stack gas on a dry basis in lb/lb. mole. is

Md = 0.44 (% CO_2) avg. + 0.32 (% O_2) avg. + 0.28 [(% N_2) avg. + (% CO) avg.

Md = 0.44 x 0.4 + 0.32 x 20.75 + 0.28 (77.95 +)

Md = 0.176 + 6.64 + 21.83 + 0.36 + (0.4)(0.7)

Md = 29.01 lb/lb. mole.

The volume of water vapour collected at reference conditions in ft^3 is

V_{wc} = 0.0474 ft^3/ml x volume of moisture collected ml.

V_{wc} = 0.0474 x 67.7

V_{wc} = 3.21 ft^3

The average ΔP orifice in in. H_2O is

$$\Delta P \text{ orifice avg.} = \frac{\Sigma \Delta P \text{ orifice}}{\# \text{ points}}$$

$$\Delta P \text{ orifice avg.} = \frac{11.584}{54}$$

ΔP orifice avg. = 0.214 in. H_2O

The pressure at the gas meter in in. Hg. is

$$P_m = P_{bar} + \frac{\Delta P \text{ orifice avg. in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg.}}$$

$$P_m = 29.53 + \frac{0.214}{13.6}$$

P_m = 29.53 + 0.0157

P_m = 29.55 in. Hg.

The temperature of the total gas meter in $^{\circ}R$. is

$$Tm = \frac{\Sigma \text{ meter temp. } ^{\circ}F.}{\# \text{ points}} + 460$$

$$Tm = \underline{\qquad\qquad} + 460$$

$$Tm = \underline{530\,^{\circ}R} \quad (\text{TEMPERATURE CONVERSION})$$

The total volume of gas metered in ft^3 is

$$Vm = Vf - Vi$$

$$Vm = \underline{\qquad} - \underline{\qquad}$$

$$Vm = \underline{54.79}\ ft^3$$

The dry gas volume at reference conditions in ft^3 is

$$Vmc = 17.71 \frac{^{\circ}R}{\text{in. Hg.}} \quad \frac{Vm\ ft^3 \times Pm \text{ in. Hg.}}{Tm\ ^{\circ}R}$$

$$Vmc = 17.71 \times \frac{54.79 \times 29.55}{530}$$

$$Vmc = \underline{54.10}\ ft^3$$

The stack gas moisture content, i.e. the proportion by volume of water vapour in the gas stream is

$$Bwo = \frac{Vwc\ ft^3}{Vwc\ ft^3 + Vmc\ ft^3} \qquad \text{(using dry-rite)}$$

$$Bwo = \frac{3.21}{3.21 + 54.10}$$

$$Bwo = \frac{3.21}{57.31}$$

$$Bwo = 0.056$$

The molecular weight of the stack gas on a wet basis in lb/lb mole. is

Ms = Md lb/lb mole (1-Bwo) + 18 lb/lb mole x Bwo

Ms = 29.01 x (1 - 0056) + 18 x 0.056

Ms = 29.01 x 0.944 + 1.008

Ms = 27.385 + 1.008

Ms = 28.39 lb/lb mole.

The average velocity of the stack in ft/sec is

$$Us = \frac{\Sigma V}{\#\ points}$$

$$Us = \frac{1116.66}{54}$$

$$Us = 20.72 \text{ ft/sec}$$

The average temperature of the stack in $^{\circ}R.$ is

$$Ts\ avg. = \frac{\Sigma\ Ts}{\#\ points} + 460$$

$$Ts\ avg. = \frac{4973}{54} + 460$$

$$Ts\ avg. = 92.1 + 460$$

$$Ts\ avg. = 552.1^{\circ}R.$$

The cross-sectional area of the stack in ft^2 is

$$As = \frac{\pi D^2 ft^2}{4}$$

$$As = \frac{\pi}{4} \times (\_\_\_\_\_)^2$$

$$As = 0.7854 \times \_\_\_\_\_$$

As = 9.0 ft^2 / FILTER DRUM

The volumetric stack gas flowrate on a dry basis at reference conditions in ft^3/hr is

$$Qs = 3600 \text{ sec/hr} \times Us \text{ ft/sec} \times As \text{ ft}^2 \times (1-Bwo) \times \frac{T \text{ ref}}{Ts \text{ avg.}} \times \frac{Ps}{P \text{ ref}}$$

$$Qs = 3600 \times 20.72 \text{ ft/sec} \times 9.0 \text{ ft}^2 \times (1 - 0.056) \times \frac{530}{552.1 \text{ }^\circ R} \times \frac{29.53 \text{ in. Hg.}}{29.92 \text{ in. Hg.}}$$

$$Qs = 3600 \times 20.72 \times 9.0 \times 0.944 \times 0.960 \times 0.987$$

Qs = 6.00×10^5 ft^3/hr / FILTER DRUM

1.80×10^6 ft^3/hr TOTAL

The total amount of particulate matter collected in mg. is

M_p = 14.3 mg.

The concentration of particulate matter in stack gas on a dry basis at reference conditions in lb/ft^3 is

$$C_p = 2.205 \times 10^{-6} \text{ lb/mg} \times \frac{M_p}{V_{mc}}$$

$$C_p = 2.205 \times 10^{-6} \times \frac{14.3 \text{ mg}}{54.10 \text{ ft}^3}$$

C_p = 5.81×10^{-7} lb/ft^3

The emission rate of particulate matter from the stack on a dry basis at reference conditions in lb/hr is

ER_p = C_p lb/ft^3 x Q_s ft^3/hr

ER_p = 5.81×10^{-7} x 6.00×10^5

ER_p = 0.349 lb/hr / FILTER ONLY

1.05 lbs/hr

PLANT GRAIN DRIER

DATE OCTOBER 27 1977

LOCATION NEWBURY ONT

OPERATORS

TEST 4

ANALYST

MOISTURE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF MOISTURE (gm.)
IMPINGER # 1	618.6	576.1	42.5
IMPINGER # 2	595.3	583.8	11.5
IMPINGER # 3	449.8	446.7	3.1
IMPINGER # 4	674.3	663.7	10.6
	TOTAL		67.7
	MOISTURE VOLUME		67.7 ml.

PARTICULATE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF PARTICULATE (gm.)
FILTER	0.7567	0.7561	0.0006
BEAKER WITH (PROBE - NOZZLE - CYCLONE) WASHINGS	48.7295	48.7261	0.0034
CYCLONE FLASK	47.7174	47.7072	0.0102
BEAKER WITH (IMPINGER FILTER-HOLDER) CONTENTS AND WASHINGS	46.7007	46.7006	0.0001
	TOTAL (gm.)		0.0143
	PARTICULATES IN (mg.)		14.3

MODEL 2165-D

PLANT ACE GRAIN DRYER

BAROMETRIC PRESSURE (IN. Hg.) 29.57

STACK PRESSURE (IN. H_2O)

LOCATION NEWBURY, ONTARIO

MOISTURE CONTENT VOL. %

TEST 5"

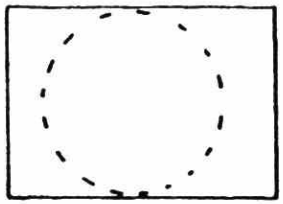
NOZZLE DIA. IN. 0.25"

DATE NOV. 2/79

PROBE LENGTH 4' EFFECTIVE

AMBIENT TEMPERATURE °F. 45

OPERATORS D.S., C.S.T.P., A.W.G.



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	89				2109.03	260	170	88	151	40	0.5"
AT-1	2.5'	89	0.03	8.00	0.024	2109.44	260	170	88	151	40	0.5"
2	5:0	89	0.02	6.53	0.016	2109.76	260	195"	80	210	40	0.5"
3	7.5"	89	0.01	4.62	0.008	2109.99	260	215"	80	230	40	0.5"
4	10.0	89	0.01	4.62	0.008	2110.21	255"	240	82	242	40	0.5"
5"	12.5"	89	0.01	4.62	0.008	2110.45"	250	255"	85"	250	40	0.5"
6	15:0	89	0.01	4.62	0.008	2110.68	245"	270	88	262	42	0.5"
	0	89				2111.02	245"	280	80	240	45"	3.0
AH-1	2.5"	89	0.28	24.45"	0.224	2112.28	245"	280	80	240	45"	3.0
2	5:0	89	0.28	24.45"	0.224	2113.53	240	260	75"	230	44	3.0
3	7.5"	93	0.27	24.10	0.22	2114.76	240	272	74	235"	45"	3.2
4	10.0	93	0.22	21.75"	0.176	2115.85"	245"	272	73	240	45"	2.7
5"	12.5"	93	0.26	23.65"	0.21	2117.03	240	275"	79	240	50	3.2
6	15:0	93	0.19	20.21	0.15"	2118.05"	235"	280	79	241	50	2.5"
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

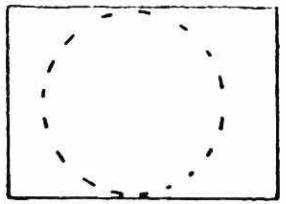
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 5 _____ NOZZLE DIA. IN. _____

DATE Nov. 2/79 _____ PROBE LENGTH _____

AMBIENT TEMPERATURE °F _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0					2118.49	240	280	85	240	51	4.2
A6-1	2.5	93	0.45	31.11	0.36	2120.07	245	280	85	240	51	4.2
2	5.0	93	0.52	33.43	0.42	2121.71	250	270	79	240	52	4.2
3	7.5	93	0.49	32.46	0.45	2123.29	255	265	78	240	52	4.1
4	10.0	93	0.46	31.45	0.37	2124.89	250	270	80	240	53	4.2
5	12.5	93	0.40	29.33	0.32	2126.39	250	270	80	230	56	4.1
6	15.0	93	0.39	28.96	0.31	2127.87	250	270	82	240	60	4.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

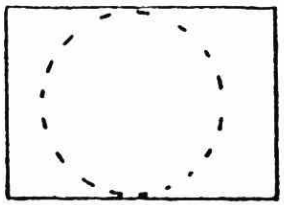
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 5 _____ NOZZLE DIA. IN. _____

DATE NOV. 2/79 _____ PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	94				2128.00	235	240	100	121	60	0.5
BT-1	2.5	94	0.01	4.64	0.008	2128.23	235	240	100	121	60	0.5
2	5.0	94	0.01	4.64	0.008	2128.46	240	235	89	200	60	0.5
3	7.5	94	0.01	4.64	0.008	2128.68	240	240	80	207	60	0.5
4	10.0	94	0.01	4.64	0.008	2128.91	240	250	81	225	61	0.5
5	12.5	94	0.01	4.64	0.008	2129.15	240	255	80	235	60	0.5
6	15.0	94	0.01	4.64	0.008	2129.38	245	270	80	240	62	0.5
	0	96				2129.51	215	280	80	240	61	4.7
BT-1	2.5	96	0.38	28.66	0.31	2130.93	250	280	80	240	61	4.7
2	5.0	96	0.30	25.47	0.25	2132.01	260	290	72	257	61	4.5
3	7.5	96	0.28	24.60	0.23	2133.08	265	290	72	260	61	4.4
4	10.0	96	0.28	24.60	0.23	2134.25	265	290	78	260	65	4.4
5	12.5	96	0.21	21.31	0.17	2135.34	265	285	78	260	64	3.8
6	15.0	96	0.21	21.31	0.17	2136.43	260	285	75	250	65	3.8
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

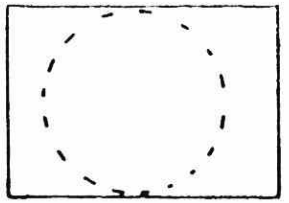
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 5 NOZZLE DIA. IN. _____

DATE Nov. 2/79 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	96				2137.03	260	285	75	242	65	6.0
B8-1	2.5	96	0.55	34.48	0.45	2138.72	255	285	75	242	65	6.0
2	5.0	96	0.52	33.53	0.43	2140.41	250	285	73	255	65	6.0
3	7.5	96	0.50	32.88	0.42	2142.06	255	282	78	245	65	6.0
4	10.0	97	0.52	33.56	0.43	2143.73	255	275	80	260	66	6.2
5	12.5	97	0.50	32.91	0.42	2145.38	250	275	75	250	67	6.1
6	15.0	97	0.40	29.43	0.33	214688	245	280	75	250	67	5.2
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

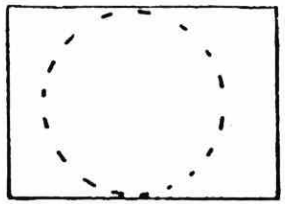
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 5' _____ NOZZLE DIA. IN. _____

DATE NOV. 2/79 _____ PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	100				2147.04	240	230	85	140	65	0.5
CT-1	2.5	100	0.01	4.23	0.008	2147.25	255	230	85	140	65	0.5
2	5.0	100	0.01	4.23	0.008	2147.45	270	237	85	175	62	0.5
3	7.5	100	0.01	4.23	0.008	2147.65	280	235	77	190	60	0.5
4	10.0	100	0.01	4.23	0.008	2147.86	270	250	80	210	60	0.5
5	12.5	100	0.01	4.23	0.008	2148.07	275	272	85	230	60	0.5
6	15.0	100	0.01	4.23	0.008	2148.28	275	295	88	250	60	0.5
	0	100				2148.46	265	300	88	250	60	3.0
CH-1	2.5	100	0.24	20.72	0.20	2149.48	265	300	88	250	60	3.0
2	5.0	100	0.26	21.57	0.22	2150.53	270	295	80	245	62	3.0
3	7.5	100	0.24	20.72	0.20	2151.55	265	285	80	240	62	3.0
4	10.0	100	0.17	17.44	0.14	2152.40	260	280	80	235	62	2.2
5	12.5	100	0.3	23.16	0.25	2153.54	260	270	80	230	62	3.2
6	15.0	100	0.25	21.15	0.21	2154.60	255	265	80	230	60	3.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

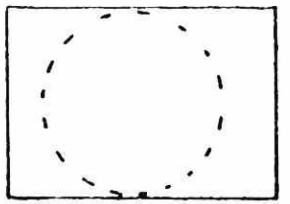
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 3 _____ NOZZLE DIA. IN. _____

DATE NOV. 2/79 _____ PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	100				2154.77	240	260	90	195	60	4.5
CB-1	2.5	100	0.55	31.37	0.45	2156.32	245	260	90	195	60	4.5
2	5.0	100	0.51	30.20	0.41	2157.80	240	250	87	230	60	4.5
3	7.5	100	0.48	29.30	0.39	2159.24	240	255	86	235	60	4.5
4	10.0	100	0.3	23.16	0.25	2160.39	235	260	90	242	60	3.3
5	12.5	100	0.52	30.50	0.42	2161.92	235	270	88	242	62	4.5
6	15.0	100	0.4	26.75	0.33	2163.24	230	275	88	245	62	3.83
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

Absolute stack gas pressure in in. Hg. is

$$Ps = Pbar + \frac{P_{static}\ in.\ H_2O}{13.6\ in.\ H_2O/in.\ Hg.}$$

$$Ps = \frac{29.57}{} + \frac{0.04}{13.6}$$

Ps = 29.57 in. Hg.

The molecular weight of the stack gas on a dry basis in lb/lb. mole. is

$$Md = 0.44\ (\%\ CO_2)\ avg. + 0.32\ (\%\ O_2)\ avg. + 0.28\ [(\%\ N_2)\ avg. + (\%\ CO)\ avg.$$

$$Md = 0.44 \times \underline{0.4} + 0.32 \times \underline{20.75} + 0.28\ (\underline{77.95} + \underline{\quad} + 0.4 \times 0.9)$$

$$Md = \underline{0.176} + \underline{6.64} + \underline{21.826} + 0.36$$

Md = 29.002 lb/lb mole.

The volume of water vapour collected at reference conditions in ft^3 is

Vwc = 0.0474 ft^3/ml x volume of moisture collected ml.

Vwc = 0.0474 x 50.8

Vwc = 2.408 ft^3

The average ΔP orifice in in. H_2O is

$$\Delta \text{ P orifice avg.} = \frac{\Sigma \Delta \text{ P orifice}}{\text{\# points}}$$

$$\Delta \text{ P orifice avg.} = \frac{10.912}{54}$$

Δ P orifice avg. = 0.202 in. H_2O

The pressure at the gas meter in in. Hg. is

$$Pm = Pbar + \frac{\Delta P \text{ orifice avg. in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg.}}$$

$$Pm = 29.57 + \frac{0.202}{13.6}$$

Pm = 29.57 + 0.015

Pm = 29.59 in. Hg.

The temperature of the total gas meter in $^{\circ}R$. is

$$Tm = \frac{\Sigma \text{ meter temp. } ^{\circ}F.}{\# \text{ points}} + 460$$

$$Tm = \frac{70}{} + 460$$

$$Tm = \underline{530^{\circ}R} \quad \text{Temperature Compensated}$$

The total volume of gas metered in ft^3 is

$$Vm = Vf - Vi$$

$$Vm = \underline{\quad} - \underline{\quad}$$

$$Vm = \underline{52.06} \ ft^3$$

The dry gas volume at reference conditions in ft^3 is

$$Vmc = 17.71 \frac{^{\circ}R}{\text{in. Hg.}} \quad \frac{Vm \ ft^3 \times Pm \text{ in. Hg.}}{Tm \ ^{\circ}R}$$

$$Vmc = 17.71 \times \frac{52.06 \times 29.59}{530}$$

$$Vmc = \underline{51.474} \ ft^3$$

The stack gas moisture content, i.e. the proportion by volume of water vapour in the gas stream is

$$Bwo = \frac{Vwc\ ft^3}{Vwc\ ft^3 + Vmc\ ft^3}$$ (using dry-rite)

$$Bwo = \frac{2.408}{2.408 + 51.474}$$

$$Bwo = \frac{2.408}{53.882}$$

$$Bwo = 0.0447$$

The molecular weight of the stack gas on a wet basis in lb/lb mole. is

Ms = Md lb/lb mole (1-Bwo) + 18 lb/lb mole x Bwo

Ms = 29.002 x (1 - 0.0447) + 18 x 0.0447

Ms = 29.002 x 0.9553 + 0.8046

Ms = 27.706 + 0.8046

Ms = 28.511 lb/lb mole.

The average velocity of the stack in ft/sec is

$$Us = \frac{\Sigma V}{\#\ points}$$

$$Us = \frac{1050.36}{54}$$

$$Us = 19.45 \text{ ft/sec}$$

The average temperature of the stack in $^{\circ}R.$ is

$$Ts\ avg. = \frac{\Sigma\ Ts}{\#\ points} + 460$$

$$Ts\ avg. = \frac{5925}{63} + 460$$

$$Ts\ avg. = 94.05 + 460$$

$$Ts\ avg. = 554.05\ ^{\circ}R.$$

The cross-sectional area of the stack in ft^2 is

$$As = \frac{\pi D^2 ft^2}{4}$$

$$As = \frac{\pi}{4} \times (\_\_\_\_\_)^2$$

$$As = 0.7854 \times \_\_\_\_\_$$

$$As = \underline{\quad 9 \quad} ft^2 \text{ / FILTER DRUM}$$

The volumetric stack gas flowrate on a dry basis at reference conditions in ft^3/hr is

$$Qs = 3600 \text{ sec/hr} \times Us \text{ ft/sec} \times As \text{ ft}^2 \times (1-Bwo) \times \frac{T \text{ ref}}{Ts \text{ avg.}} \times \frac{Ps}{P \text{ ref}}$$

$$Qs = 3600 \times \underline{19.45} \text{ ft/sec} \times \underline{\quad 9 \quad} ft^2 \times (1 - \underline{0.0447}) \times \frac{530}{\underline{554.05}^\circ R} \times \frac{\underline{29.57 \text{ in. Hg.}}}{29.92 \text{ in. Hg.}}$$

$$Qs = 3600 \times \underline{19.45} \times \underline{\quad 9 \quad} \times \underline{0.9553} \times \underline{0.9566} \times \underline{0.9883}$$

$$Qs = \underline{5.691 \times 10^5} ft^3/hr \text{ / FILTER DRUM}$$

The total amount of particulate matter collected in mg. is

M_p = 15.0 mg.

The concentration of particulate matter in stack gas on a dry basis at reference conditions in lb/ft^3 is

$$C_p = 2.205 \times 10^{-6} \text{ lb/mg} \times \frac{M_p}{V_{mc}}$$

$$C_p = 2.205 \times 10^{-6} \times \frac{15.0 \text{ mg}}{51.474 \text{ ft}^3}$$

$$C_p = 6.426 \times 10^{-7} \text{ lb/ft}^3$$

The emission rate of particulate matter from the stack on a dry basis at reference conditions in lb/hr is

ER_p = C_p lb/ft^3 x Q_s ft^3/hr

ER_p = 6.426×10^{-7} x 5.691×10^{5}

ER_p = 0.366 lb/hr / FILTER DRUM

= 1.098 lb/hr Total

PLANT SAWMILL DRYER

DATE [illegible]

LOCATION HENBURY SOUTH D

OPERATORS

TEST 5

ANALYST

MOISTURE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF MOISTURE (gm.)
IMPINGER # 1	584.7	557.5	27.2
IMPINGER # 2	572.4	562.9	9.5
IMPINGER # 3	441.3	439.5	1.8
IMPINGER # 4	671.5	659.2	12.3
	TOTAL		50.8
	MOISTURE VOLUME		50.8 ml.

PARTICULATE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF PARTICULATE (gm.)
FILTER	0.7556	0.7551	0.0005
BEAKER WITH (PROBE - NOZZLE - CYCLONE) WASHINGS	51.0589	51.0542	0.0047
CYCLONE FLASK	48.7645	48.7552	0.0093
BEAKER WITH (IMPINGER FILTER-HOLDER) CONTENTS AND WASHINGS	48.8082	48.8077	0.0005
	TOTAL (gm.)		0.0150
	PARTICULATES IN (mg.)		15.0

MODEL 2165-D

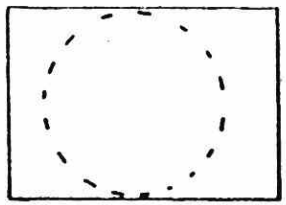
PLANT ACE GRAIN DRYER — BAROMETRIC PRESSURE (IN. Hg.) 29.57 — STACK PRESSURE (IN. H_2O) ____

LOCATION MCCONEY, ONTARIO — MOISTURE CONTENT VOL. % ____

TEST 6 — NOZZLE DIA. IN. 0.250

DATE NOVEMBER 2, 1979 — PROBE LENGTH 4' EFFECTIVE

AMBIENT TEMPERATURE °F. 45 — OPERATORS AWG, DS, CSP



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	92				2175.74	240	220	41	80	48	—
OT-1	2.5	92	0.02	6.57	0.016	2176.06	245	225	45	100	48	0.5
2	5.0	92	0.01	4.65	0.008	2176.29	250	225	45	102	49	0.5
3	7.5	92	0.01	4.65	0.008	2176.51	255	230	45	112	48	0.5
4	10.0	92	0.01	4.65	0.008	2176.74	260	235	44	120	48	0.5
5	12.5	92	0.01	4.65	0.008	2176.96	265	235	45	135	48	0.5
6	15.0	92	0.01	4.65	0.008	2177.19	265	240	44	142	47	0.5
	0	92				2177.19	260	235	45	140	48	—
OM-1	2.5	92	0.23	21.28	0.19	2178.27	265	240	45	140	50	5.0
2	5.0	92	0.20	20.78	0.16	2179.38	270	245	45	147	50	5.1
3	7.5	94	0.20	20.82	0.16	2180.78	270	250	42	161	50	5.1
4	10.0	94	0.12	16.12	0.10	2181.08	265	250	43	170	50	5.1
5	12.5	94	0.16	18.12	0.13	2181.97	260	250	44	170	50	5.1
6	15.0	94	0.14	11.42	0.11	2182.82	260	245	44	172	50	5.1
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

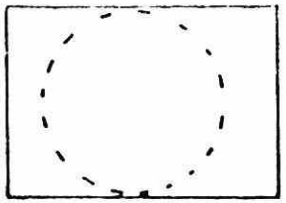
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 6 NOZZLE DIA. IN. 0.250

DATE NOVEMBER 2 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	94				2187.82	255	260	45	160	55	--
DR-1	2.5	94	0.32	26.33	0.26	2184.09	255	265	45	160	55	4.5
2	5.0	94	0.35	27.59	0.29	2185.42	255	260	45	185	57	4.6
3	7.5	94	0.34	27.14	0.28	2186.73	250	260	42	180	55	4.7
4	10.0	94	0.28	24.63	0.23	2187.91	250	265	45	170	57	4.0
5	12.5	94	0.29	25.07	0.24	2189.12	245	270	45	172	57	4.1
6	15.0	94	0.23	22.32	0.19	2190.18	240	270	45	175	60	3.5
	0	100				2190.52	240	245	45	100	55	—
ET-1	2.5	100	0.01	4.68	0.008	2190.75	235	240	45	110	55	0.5
2	5.0	100	0.01	4.68	0.008	2190.97	235	240	45	120	55	0.5
3	7.5	100	0.01	4.68	0.008	2191.20	230	240	45	140	55	0.5
4	10.0	100	0.01	4.68	0.008	2191.43	230	240	44	145	55	0.5
5	12.5	100	0.01	4.68	0.008	2191.66	230	240	44	147	55	0.5
6	15.0	100	0.01	4.68	0.008	2191.89	230	240	43	150	55	0.5
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

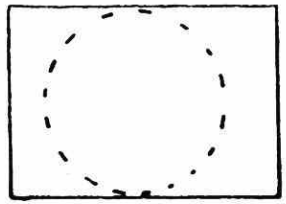
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 6 NOZZLE DIA. IN. 0.250

DATE NOVEMBER 2, 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	100				2191.89	235	250	41	140	55	—
FH-1	2.5	100	0.28	24.76	0.23	2193.08	240	255	44	150	56	4.2
2	5.0	100	0.20	20.93	0.16	2194.08	245	250	44	175	58	4.2
3	7.5	100	0.23	22.49	0.19	2195.16	250	260	42	185	57	3.6
4	10.0	100	0.23	22.44	0.19	2196.24	250	272	41	140	59	3.1
5	12.5	100	0.25	23.90	0.21	2197.36	250	270	42	200	61	3.1
6	15.0	100	0.19	20.40	0.16	2198.34	250	260	45	201	60	3.3
	0	110				2198.34	245	270	42	110	60	—
FH-1	2.5	110	0.465	31.91	0.31	2199.87	250	270	46	110	60	4.2
2	5.0	110	0.40	29.60	0.32	2201.29	250	272	45	200	60	3.9
3	7.5	110	0.41	29.96	0.33	2202.13	250	272	46	195	61	3.2
4	10.0	110	0.38	28.85	0.30	2109.13	255	275	46	205	61	4.1
5	12.5	110	0.36	28.08	0.27	2105.48	255	270	46	200	63	4.1
6	15.0	110	0.32	26.47	0.26	2206.76	255	270	47	195	63	4.1
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

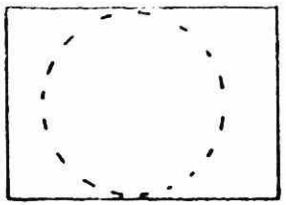
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 6 NOZZLE DIA. IN. 0.250

DATE November 2, 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	100				2210.02	235	250	44	115	60	—
FT-1	2.5	100	0.01	4.68	0.008	2210.25	235	252	41	115	60	3.5
2	5.0	102	0.01	4.69	0.008	2210.48	240	255	48	125	60	3.5
3	7.5	102	0.01	4.69	0.008	2210.70	240	257	48	140	60	3.5
4	10.0	102	0.01	4.69	0.008	2210.93	242	260	48	147	60	3.5
5	12.5	102	0.01	4.69	0.008	2211.16	245	263	49	157	60	3.5
6	15.0	102	0.01	4.69	0.008	2211.38	248	270	41	165	61	3.5
	0	102				2211.38	235	270	41	160	61	—
FT-1	2.5	102	0.30	15.68	0.25	2212.62	240	270	44	180	61	4.0
2	5.0	102	0.24	21.97	0.20	2213.73	245	270	45	200	62	3.7
3	7.5	102	0.21	21.98	0.17	2214.78	250	270	45	200	62	3.5
4	10.0	102	0.16	18.75	0.13	2215.66	250	270	45	200	63	3.5
5	12.5	102	0.21	21.98	0.17	2216.68	250	270	46	202	63	3.5
6	15.0	102	0.19	19.75	0.15	2217.65	250	270	42	200	63	3.5
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

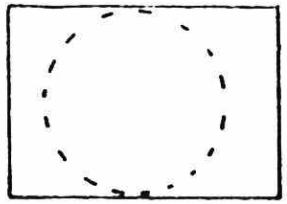
PLANT _____ BAROMETRIC PRESSURE (IN. Hg.) _____ STACK PRESSURE (IN. H_2O) _____

LOCATION _____ MOISTURE CONTENT VOL. % _____

TEST 6 NOZZLE DIA. IN. 0.250

DATE November 2 1979 PROBE LENGTH _____

AMBIENT TEMPERATURE °F. _____ OPERATORS _____



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	102				2217.65	245	285	48	200	65	—
A-1	2.5	102	0.38	28.90	0.31	2219.04	240	290	48	200	65	4.0
2	5.0	102	0.34	27.34	0.27	2220.36	240	290	46	195	65	4.0
3	7.5	102	0.43	30.74	0.35	2221.83	235	295	46	210	64	5.0
4	10.0	102	0.39	29.28	0.32	2223.24	235	295	44	210	63	5.0
5	12.5	102	0.41	30.02	0.34	2224.68	235	300	50	210	65	5.0
6	15.0	102	0.38	28.90	0.33	2226.08	235	300	50	200	65	5.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

Absolute stack gas pressure in in. Hg. is

$$Ps = Pbar + \frac{P_{static}\ \text{in. } H_2O}{13.6\ \text{in. } H_2O/\text{in. Hg.}}$$

$$Ps = \frac{29.57}{} + \frac{0.04}{13.6}$$

Ps = 29.57 in. Hg.

The molecular weight of the stack gas on a dry basis in lb/lb. mole. is

Md = 0.44 (% CO_2) avg. + 0.32 (% O_2) avg. + 0.28 [(% N_2) avg. + (% CO) avg.

Md = 0.44 x 0.40 + 0.32 x 20.8 + 0.28 (77.4 + 0.40 (0.9) + 0.3)

Md = 0.176 + 6.656 + 21.812

Md = 29.00 lb/lb mole.

The volume of water vapour collected at reference conditions in ft^3 is

V_{wc} = 0.0474 ft^3/ml x volume of moisture collected ml.

V_{wc} = 0.0474 x 61.2

V_{wc} = 2.90 ft^3

The average ΔP orifice in in. H_2O is

$$\Delta P \text{ orifice avg.} = \frac{\Sigma \Delta P \text{ orifice}}{\# \text{ points}}$$

$$\Delta P \text{ orifice avg.} = \frac{7.492}{54}$$

ΔP orifice avg. = 0.157 in. H_2O

The pressure at the gas meter in in. Hg. is

$$P_m = P_{bar} + \frac{\Delta P \text{ orifice avg. in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg.}}$$

$$P_m = 29.57 + \frac{0.157}{13.6}$$

P_m = 29.57 + 0.012

P_m = 29.58 in. Hg.

The temperature of the total gas meter in ^{o}R. is

$$Tm = \frac{\Sigma \text{ meter temp. } ^{o}F.}{\# \text{ points}} + 460$$

$$Tm = \underline{\qquad\qquad} + 460$$

$$Tm = \underline{530\ ^{o}R}$$

The total volume of gas metered in ft^3 is

$$Vm = Vf - Vi$$

$$Vm = \underline{\qquad} - \underline{\qquad}$$

$$Vm = \underline{46.74}\ ft^3$$

The dry gas volume at reference conditions in ft^3 is

$$Vmc = 17.71 \frac{^{o}R}{\text{in. Hg.}} \quad \frac{Vm\ ft^3 \times Pm \text{ in. Hg.}}{Tm\ ^{o}R}$$

$$Vmc = 17.71 \times \frac{46.74 \times 29.58}{530}$$

$$Vmc = \underline{46.20}\ ft^3$$

The stack gas moisture content, i.e. the proportion by volume of water vapour in the gas stream is

$$Bwo = \frac{Vwc\ ft^3}{Vwc\ ft^3 + Vmc\ ft^3} \qquad \text{(using dry-rite)}$$

$$Bwo = \frac{2.90}{2.90 + 46.20}$$

$$Bwo = 0.059$$

$$Bwo = 0.059$$

The molecular weight of the stack gas on a wet basis in lb/lb mole. is

Ms = Md lb/lb mole (1-Bwo) + 18 lb/lb mole x Bwo

Ms = 29.00 x (1 - 0.059) + 18 x 0.059

Ms = 29.00 x 0.941 + 1.062

Ms = 27.289 + 1.062

Ms = 28.35 lb/lb mole.

The average velocity of the stack in ft/sec is

$$Us = \frac{\Sigma V}{\#\ points}$$

$$Us = \frac{970.33}{54}$$

$$Us = 17.97 \text{ ft/sec}$$

The average temperature of the stack in $^{\circ}R.$ is

$$Ts\ avg. = \frac{\Sigma\ Ts}{\#\ points} + 460$$

$$Ts\ avg. = \frac{5370}{54} + 460$$

$$Ts\ avg. = 99.44 + 460$$

$$Ts\ avg. = 559.4\ ^{\circ}R.$$

The cross-sectional area of the stack in ft^2 is

$$As = \frac{\pi D^2 ft^2}{4}$$

$$As = \frac{\pi}{4} \times (\_\_\_\_\_)^2$$

$$As = 0.7854 \times \_\_\_\_\_$$

$$As = \underline{9.0} \ ft^2 \ / \text{FILTER CROSS}$$

The volumetric stack gas flowrate on a dry basis at reference conditions in ft^3/hr is

$$Qs = 3600 \text{ sec/hr} \times Us \text{ ft/sec} \times As \ ft^2 \times (1-Bwo) \times \frac{T \text{ ref}}{Ts \text{ avg.}} \times \frac{Ps}{P \text{ ref}}$$

$$Qs = 3600 \times \underline{17.97} \text{ ft/sec} \times \underline{9.0} \ ft^2 \times (1 - \underline{0.059}) \times \frac{530}{559.4^\circ R} \times \frac{\underline{29.57} \text{ in. Hg.}}{29.92 \text{ in. Hg.}}$$

$$Qs = 3600 \times \underline{17.97} \times \underline{9.0} \times \underline{0.941} \times \underline{0.9974} \times \underline{0.9883}$$

$$Qs = \underline{5.13 \times 10^5} \ ft^3/hr \ / \text{FILTER CROSS}$$

$$= \underline{1.54 \times 10^6} \ ft^3/hr \text{ TOTAL}$$

The total amount of particulate matter collected in mg. is

M_p = 9.3 mg.

The concentration of particulate matter in stack gas on a dry basis at reference conditions in lb/ft^3 is

$$C_p = 2.205 \times 10^{-6} \text{ lb/mg} \times \frac{M_p}{V_{mc}}$$

$$C_p = 2.205 \times 10^{-6} \times \frac{9.3 \text{ mg}}{46.20 \text{ ft}^3}$$

C_p = 4.44×10^{-7} lb/ft^3

The emission rate of particulate matter from the stack on a dry basis at reference conditions in lb/hr is

ER_p = C_p lb/ft^3 x Q_s ft^3/hr

ER_p = 4.44×10^{-7} x 5.13×10^5 / FILTER DRUM

ER_p = 0.228 lb/hr / FILTER DRUM

= 0.684 lb/hr

PLANT GRAIN DRYER

DATE NOVEMBER 2 1977

LOCATION NEWBURY, ONTARIO

OPERATORS

TEST 6

ANALYST

MOISTURE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF MOISTURE (gm.)
IMPINGER # 1	630.8	591.4	39.4
IMPINGER # 2	581.2	573.7	7.5
IMPINGER # 3	493.0	491.5	1.5
IMPINGER # 4	675.2	662.4	12.8
	TOTAL		61.2
	MOISTURE VOLUME		61.2 ml.

PARTICULATE DATA

	FINAL WEIGHT (gm.)	TARE WEIGHT (gm.)	WEIGHT OF PARTICULATE (gm.)
FILTER	0.7662	0.7663	0.0000
BEAKER WITH (PROBE - NOZZLE - CYCLONE) WASHINGS	51.0612	51.0592	0.0020
CYCLONE FLASK	46.3421	46.3352	0.0069
BEAKER WITH (IMPINGER FILTER-HOLDER) CONTENTS AND WASHINGS	48.8071	48.8067	0.0004
	TOTAL (gm.)		0.0093
	PARTICULATES IN (mg.)		9.3

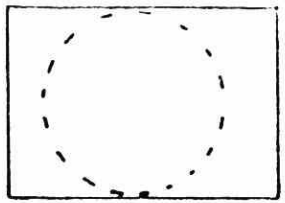
PLANT [illegible] BAROMETRIC PRESSURE (IN. Hg.) 27.47 STACK PRESSURE (IN. H2O)

LOCATION [illegible] MOISTURE CONTENT VOL. %

TEST UNITED 1 NOZZLE DIA. IN. 0.250

DATE OCTOBER 23, 1979 PROBE LENGTH 4'

AMBIENT TEMPERATURE °F. 48 OPERATORS AWG, OS, CSP



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H2O)	GAS METER VOLUME (FT.³)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	93				1936.28	275	250	44	165	55	—
TB-1	5	93	0.58	35.34	0.56	1940.92	280	255	41	165	55	6.0
2	10	93	0.58	35.34	0.56	1944.14	285	260	41	170	55	6.0
3	15	93	0.55	34.42	0.56	1947.98	280	260	41	170	55	6.0
4	20	93	0.62	36.54	0.56	1951.80	280	255	42	175	55	6.0
5	25	93	0.60	35.95	0.56	1955.63	275	260	42	175	55	6.0
6	30	93	0.57	33.96	0.56	1959.48	270	260	42	175	55	6.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

MODEL 2165-D

PLANT ACE GRAIN DRYER

BAROMETRIC PRESSURE (IN. Hg.) 29.53

STACK PRESSURE (IN. H_2O)

LOCATION NEWBURY, ONTARIO

MOISTURE CONTENT VOL. %

TEST ANDERSEN TEST 2

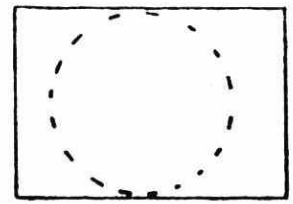
NOZZLE DIA. IN. 0.375"

DATE OCT. 27/79

PROBE LENGTH 4' EFFECTIVE

AMBIENT TEMPERATURE °F. 44

OPERATORS A.W.G., D.S., C.S.T.P.



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	105'				2080.01	275	270	40	180	64	9.0
TO-1	5'	105'	0.42	30.46	0.9	2084.75'	275'	270	40	180	64	9.0
2	10	105'	0.53	34.22	0.9	2089.48	280	280	41	205'	64	9.0
3	15'	105'	0.48	32.57	0.9	2094.23	280	290	41	220	62	9.0
4	20	105'	0.27	24.42	0.9	2099.04	280	290	45'	200	65'	9.0
5'	25'	105'	0.27	24.42	0.9	2103.88	285'	270	45'	215'	65'	9.0
6	30	105'	0.17	24.42	0.9	2108.72	285'	225'	41	190	62	9.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

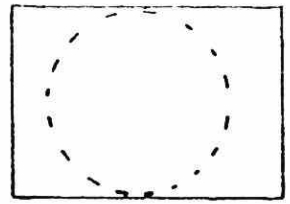
PLANT [illegible] BAROMETRIC PRESSURE (IN. Hg.) 27.37 STACK PRESSURE (IN. H_2O) ____

LOCATION [illegible] MOISTURE CONTENT VOL. % ____

TEST Anchor Stn 3 NOZZLE DIA. IN. 0.375

DATE November 2, 1979 PROBE LENGTH 4' Effective

AMBIENT TEMPERATURE °F 45 OPERATORS AWG, DS, CSP



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	90				2230.46	230	230	46	135	53	—
TM-1	5	90	0.26	21.39	0.81	2235.02	235	235	45	145	55	10.0
2	10	90	0.26	21.39	0.78	2239.50	240	240	48	185	57	10.0
3	15	95	0.17	19.77	0.76	2243.89	245	245	50	190	58	10.0
4	20	95	0.18	19.77	0.755	2248.29	240	252	55	200	60	10.0
5	25	100	0.20	20.93	0.755	2252.66	240	252	55	200	60	10.0
6	30	100	0.20	20.93	0.75	2257.05	240	251	55	200	60	10.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

APPENDIX III

NATURAL GAS COMPOSITION

Component	% by Volume
Methane	94
Ethane	2.960
Propane	0.350
Isobutane	0.030
Butane	0.040
Isopentane	0.002
Nitrogen	2.170
Carbon Dioxide	0.41

TABLE III.1: Composition of Natural Gas Supplied to the Newbury, Ontario Region [12]

APPENDIX III

NATURAL GAS COMPOSITION

These data are on file with:

Technology Development and Appraisal Section
Air Resources Branch
Ministry of the Environment
Province of Ontario
880 Bay Street, 4th Floor
Toronto, Ontario M5S 1Z8

Component	% by Volume
Methane	94
Ethane	2.960
Propane	0.350
Isobutane	0.030
Butane	0.040
Isopentane	0.002
Nitrogen	2.170
Carbon Dioxide	0.41

TABLE III.1: Composition of Natural Gas Supplied to the Newbury, Ontario Region [12]

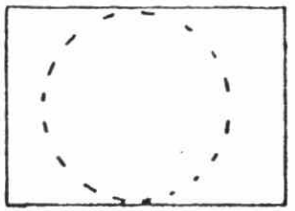
PLANT [illegible] BAROMETRIC PRESSURE (IN. Hg.) 29.47 STACK PRESSURE (IN. H_2O) ____

LOCATION NEWBURY, ONTARIO MOISTURE CONTENT VOL. % ____

TEST ANDERSON 1 NOZZLE DIA. IN. 0.250

DATE OCTOBER 26, 1979 PROBE LENGTH 4'

AMBIENT TEMPERATURE °F. 42 OPERATORS AWG, DS, CSP



TEST TRAVERSES $C_p = .671$

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. Hg.)
	0	93				1936.28	275	250	44	165	55	—
1B-1	5	93	0.58	35.34	0.56	1940.92	280	255	41	165	55	6.0
2	10	93	0.58	35.34	0.56	1944.14	285	260	41	170	55	6.0
3	15	93	0.55	34.92	0.56	1947.98	270	260	41	170	55	6.0
4	20	93	0.62	36.54	0.56	1951.80	280	255	42	175	55	6.0
5	25	93	0.60	35.95	0.56	1955.63	275	260	42	175	55	6.0
6	30	93	0.52	33.46	0.56	1959.43	270	260	42	175	55	6.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

PLANT ACE GRAIN DRYER

LOCATION NEWBURY, ONTARIO

TEST ANDERSEN TEST 2

DATE OCT. 27/79

AMBIENT TEMPERATURE °F 44

BAROMETRIC PRESSURE (IN. Hg.) 29.53

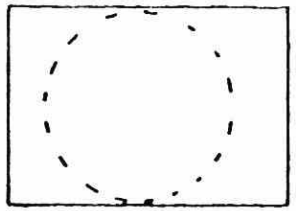
MOISTURE CONTENT VOL. %

NOZZLE DIA. IN. 0.375"

PROBE LENGTH 4' EFFECTIVE

OPERATORS AWG, D.S., C.S.T.P.

STACK PRESSURE (IN. H_2O)



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F.)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. H_g.)
	0	105"				2080.01	275	270	40	180	64	9.0
TO-1	5'	105"	0.42	30.46	0.9	2084.75"	275"	270	40	180	64	9.0
2	10	105"	0.53	34.22	0.9	2089.48	280	280	41	205"	64	9.0
3	15"	105"	0.48	32.57	0.9	2094.23	280	290	41	220	62	9.0
4	20	105"	0.27	24.12	0.9	2099.04	280	290	45"	200	65"	9.0
5"	25"	105"	0.27	24.42	0.9	2103.88	285"	270	45"	215"	65"	9.0
6	30	105"	0.17	24.12	0.9	2108.72	285"	225"	41	190	62	9.0
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA

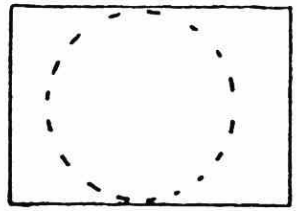
PLANT ACC GRAIN ONARGA · BAROMETRIC PRESSURE (IN. Hg.) 27.57 STACK PRESSURE (IN. H_2O)

LOCATION ONARGA, ILLINOIS · MOISTURE CONTENT VOL. %

TEST ANDERSEN 3 · NOZZLE DIA. IN. 0.375

DATE NOVEMBER 2, 1979 · PROBE LENGTH 4' EFFECTIVE

AMBIENT TEMPERATURE °F 45 · OPERATORS AWG, DS, CSP



TEST TRAVERSES

TRAVERSE POINT	TIME (MIN.)	STACK GAS TEMP. (°F.)	S-TYPE PITOT ΔP (IN. H_2O)	VEL. (FT./SEC.)	ORIFICE ΔP (IN. H_2O)	GAS METER VOLUME ($FT.^3$)	PROBE TEMP. (°F)	OVEN TEMP. (°F.)	IMPINGERS TEMPERATURE (°F.) OUTLET	IMPINGERS TEMPERATURE (°F.) INLET	GAS METER TEMP. (°F.)	PUMP VAC. (IN. H_g.)
	0	90				2230.46	230	230	46	135	53	
P1-1	5	90	0.26	21.39	0.81	2235.02	235	235	45	145	55	
2	10	90	0.26	21.39	0.78	2239.50	240	240	48	185	57	
3	15	95	0.18	19.77	0.76	2243.89	245	245	50	190	58	
4	20	95	0.18	19.77	0.755	2248.29	240	252	55	200	60	
5	25	100	0.20	20.93	0.755	2252.66	240	252	55	200	59	
6	30	100	0.20	20.93	0.75	2257.05	240	251	55	200	60	
	TOTAL	AVERAGE		AV.		TOTAL			AVERAGE		AV.	

PARTICULATE SAMPLING DATA